

VOL. XXXII.]

1889.

[No. 146.

JOURNAL

OF THE

Royal

United Service Institution.

WHITEHALL YARD.

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL.

COMMUNICATIONS TO BE SENT TO CAPT. BURGESS,

THE EDITOR.

Authors alone are responsible for the contents of their respective Papers.



LONDON:

PUBLISHED BY W. MITCHELL AND CO.,

CRAIG'S COURT, CHARING CROSS,

NEAR THE ADMIRALTY AND HORSE GUARDS.

ENTERED AT STATIONERS HALL. ALL RIGHTS RESERVED.

HARRISON AND SONS, PRINTERS IN ORDINARY TO HER MAJESTY, ST. MARTIN'S LANE.

PRICE 5s.

SUBSCRIPTION.

An Entrance Fee of One Pound on joining the Institution.

ANNUAL SUBSCRIPTION, ONE POUND.

LIFE SUBSCRIPTION (including Entrance Fee), TEN POUNDS.

ANNUAL SUBSCRIPTIONS are due on the 1st of January in each year.

When a Member joins the Institution on or after the 1st of October, having paid his first Annual Subscription, he will not be charged a second Subscription on the following 1st of January, but it will become due on the 1st of January of the second year.

THE JOURNAL.

The Journal is sent post-free to Annual Subscribers of One Pound, and to Life Subscribers of Ten Pounds; should a Member's Subscription fall in arrear, the issue of the Journal is stopped, and is only resumed after such Subscription has been paid.

Members wishing to obtain a separate copy of any lecture can do so on application to the Secretary, and on payment of 1s. per copy, exclusive of postage.

A small number are struck off for this purpose after the publication of each number of the Journal, for the accommodation of Members.

Members on changing their addresses are particularly requested to notify each change to the Secretary, in order that delay in forwarding the Journals and other communications may be avoided as much as possible.

N.B.—For forms of Membership, see page 3 of wrapper.

B. BURGESS, CAPTAIN,

Secretary.

WHITBREAD YARD,

January 1899.



Royal United Service Institution.

MEMORANDUM FOR 1889.

The Council having decided that a Gold Medal be granted annually for the best Essay on a Naval or a Military subject, make known the conditions of competition:—

- (1) The Candidates must be Members of the Institution, or persons eligible to become Members, according to the following Extract from the Bye-laws, Section II., paragraphs 1 and 2, viz.:—
 1. "Princes of the Royal Blood; Lords Lieutenant of Counties; Governors of Colonies and Dependencies; Officers of the Army, Navy, Marines, Her Majesty's East Indian Military and Naval Forces, Militia, Yeomanry, Royal Naval Reserve, and Volunteer Corps shall be entitled to become Members *without Ballot* of the Council.
 2. "Ex-Governors of Colonies and Dependencies; Officers who have quitted the Service; Deputy Lieutenants of Counties; Civil Functionaries who are or have been attached to the Naval and Military Departments; the Master, Deputy-Master, and Elder Brethren of the Trinity House; and Army and Navy Agents; shall be *eligible* to become Members by *Ballot* of the Council."
- (2) The subject for this year shall be of a Naval character.
- (3) The Essays must not exceed 48 pages (exclusive of tables), of the size and style of the "Journal," each page averaging 540 words
- (4) The Essays must be received by the Secretary, on or before the 1st NOVEMBER, 1889, except in the case of those forwarded from India, China, the Pacific, and Australia, which will be received to the 1st DECEMBER.
- (5) The Essays must be strictly anonymous, but each to have a Motto, and to be accompanied by a sealed envelope with the Motto written on the outside, and the name of the Candidate inside.
- (6) The Essays will be submitted for decision to three Referees chosen by the Council; but no award will be made by them in favour of any Essay which does not, in their opinion, attain a sufficient standard of excellence.
- (7) The award of the Referees will be made known, and the Medal will be presented to the successful Candidate (or his representative) at the Anniversary Meeting, and his Essay will be printed in the "Journal."

The following is the subject for the Essay for the present year:—

"The Maritime Defence of the United Kingdom (including its Colonies and Dependencies) and its trade, in a War with a great Maritime Power, showing the fleet considered necessary and its disposition."

By Order,

B. BURGESS, CAPTAIN,

Secretary.

WHITEHALL YARD, LONDON,

1st January, 1889.

The Journal
OF THE
Royal United Service Institution.

VOL. XXXII.

1889.

No. 146.

Friday, July 6, 1888.

REAR-ADMIRAL P. H. COLOMB, Member of Council, in the Chair.

THE PROPELLING MACHINERY OF MODERN WAR
VESSELS.

By H. J. ORAM, Esq., Engineer R.N., of the Controller of the Navy's Department, Instructor in Marine Engineering at the Royal Naval College, Greenwich.

I THINK we may safely say that in no department of naval science have greater or more important changes recently taken place than in that of "marine engineering" as applied to war ships, and the object of this paper is to describe the most important of these recent changes, and some other matters of interest, in connection principally with the propelling machinery of our modern war ships. Some of these changes are simply extensions of principles which have been in application for very many years, while other important ones are of recent introduction, and a very encouraging feature of any review of the subject is the fact that those improvements which have been introduced in very recent years are very considerable ones, and as there is no more reason to think that we are approaching finality in these matters now than there was in the old days, we may anticipate still further improvements in the near future, although their direction may not be evident. Endeavours to forecast the direction in which improvements would take place have not been very successful in the past, for on looking over old papers on this subject one is struck with the frequency with which the writers confidently anticipate that improvements in efficiency would next take place in the mode of generation of the steam rather than in the method of utilizing it, whereas we know that the improvements that have occurred have been in quite the reverse direction.

It will be interesting to refer to one great change which was made many years ago in the propelling apparatus, which caused the first considerable step to be taken in the direction of increasing the speed

of our vessels. This great change was the substitution of the screw-propeller for the older paddle-wheel, a step that not only revolutionized the internal arrangements of war vessels, and greatly increased their power of offence and defence, but also brought nearer much of the progress that has since been made in producing vessels of high speed. The screw was generally adopted into the Navy about the year 1850, after the Admiralty trials between paddle and screw vessels in 1843 and 1849 had clearly demonstrated that the screw was at least as efficient as the paddle-wheel as a propelling agent. Considering all the circumstances, however, it is to be wondered at that the paddle held the place it did for so long a time, for even supposing some little sacrifice of propelling efficiency to have been necessary, yet considering the very prominent disadvantages attending the use of the paddle, such as having the paddles themselves and important parts of their machinery above the water-line, and greatly exposed to the risk of damage in action, the interference of the paddle-boxes with the deck arrangements, such as those for working and training the guns, and the falling off in efficiency of the paddle on long voyages when the draught of the vessel lightens, owing to the consumption of coal and other stores, the balance of advantage would still have been much in favour of the screw.

After the screw had been adopted, the information available at that time as to its proper proportions, all obtained from actual experiment, clearly indicated that for efficient action the ratio of its pitch to diameter should be within certain limits, and as the greatest diameter of propeller was limited by the draught of water, it occurred that the pitch required, with the speeds of engines that had up to that time been usual with the paddle-wheel, was too great to be within the limits which experiment had shown to be necessary, and the only alternative was to increase the number of revolutions made by the screw so as to lessen its pitch. Many of the first screw vessels, however, had the same speed of *engine* as usual with the paddle-wheel, the necessary increase of speed of screw being obtained by fitting gearing between the engine and propeller shaft; but the gain to be effected by omitting this cumbersome gearing, and by directly connecting the engine with the propeller shaft, being obvious, and a good deal of improvement having been effected in the workmanship of the engine, which made it possible to do this, the gearing was soon omitted, and the engine connected direct to the propeller shaft, thus working at a much higher number of revolutions than before. These changes resulted largely in reducing the space required for and the weight of the engines; they were the first considerable steps taken in this direction, and many of the more recent developments have consisted in still further adding to the speed of the engine, with corresponding reductions in the space and weight required.

A short account of the principal steps that have accompanied the development of war-ship machinery, more especially since the introduction of the screw propeller, and up to about the year 1880, was given in a paper entitled "The Relations between the Size, Speed, and Power of Marine Engines," which was read at this Institution in

1882, by Mr. Sennett, now the Engineer-in-Chief of the Navy.¹ As stated there, the principal steps up to that date, since the change of type of propeller, were, *first*, the change of type of condenser from the jet condensing to the surface condensing variety, a step than which no others have been so far-reaching and important in their influence: and *second*, the alteration of type of engine, from the simple expansion type, which takes the boiler steam into a cylinder, and after expanding in that cylinder exhausting direct to the condenser, to the compound type, in which steam of full boiler pressure is taken into a small cylinder, and after expanding there, is led to one or more larger cylinders in which the steam completes its expansion, and performs more work before entering the condenser. Also throughout the whole time there was a gradual increase, both in the working pressure of steam and in the speed of the engines, with a corresponding diminution of the weight of the machinery; and further, that when, on the introduction of the surface condenser, the working steam pressure was raised to 60 lbs. per square inch, there was an important change in form of the multitubular boiler used, from the rectangular, or flat-sided type, to the cylindrical type, this latter variety of boiler with certain modifications of detail still remaining the usual type at the present time.

I will now briefly describe the most important changes which have taken place in war-ship machinery since the end of the period named, *i.e.*, during the last eight years, and some of the effects of those changes.

In the engine-room the great improvement which has been one of the leading features of this period has been the abandonment of the ordinary compound engine, in which the expansion of the steam is carried out in two stages, and the adoption of the triple expansion engine, in which the steam expands successively in three cylinders entirely separate before finally entering the condenser. Theoretical considerations have from very early days directed the attention of engineers to the use of higher pressures of steam, and more complete utilization of the property of expansion for increasing the efficiency of the engine, and hence reducing the consumption of fuel, and since the principal barrier to the use of high pressure steam was removed soon after 1860, by the adoption of the surface condenser, the rise of working steam pressure has been very considerable and particularly rapid during the last few years. The success of the compound engine compared with the simple engine is a historical fact, but it is interesting to remember now that probably no question caused more difference of opinion among engineers than as to the advisability of adopting the compound engine. It must be admitted that theory did not assist in the suggestion of this great change, but rather the reverse, for as far as the question was then understood, there could be no difference between the amount of work to be obtained from a certain quantity of steam, whether it was expanded in one cylinder or in two or more. In fact, the explanation of the action by which the benefit

¹ See Journal, vol. xxvi, No. 118.

was secured, came *after* the success of the compound engine. The explanation is now well known, and is to be found in the inherent defects from a thermo-dynamic point of view of the metals we are compelled to use for our cylinder surfaces, causing a loss to be experienced by the alternate condensation during steam admission, and re-evaporation during exhaust of water on the surfaces of the cylinder. This loss is greater the greater the range of temperature experienced by the cylinders, and the gain in the compound engine was due principally to the fact that the total fall from the boiler temperature down to that of the condenser was divided into two portions, only about one half the total fall taking place in each cylinder.

In 1880 the steam pressure had risen to 90 lbs., which amount was fitted in several vessels about this period, but it soon, by successive steps, rose to 120 lbs., which is the working pressure of the compound engines of the "Curlew" and others tried in 1885. At about this pressure, however, simple calculation showed that the same defects as regards excessive range of temperature in any one cylinder were experienced in the compound engine as in the old simple engine, though in a lesser degree, and the type of engine was soon changed to the triple expansion, in which, among other advantages, the total fall of temperature is split up into three separate stages.

Since 1885, with a few minor exceptions, all new engines for the Navy have been on this principle, the boiler pressure being in the first of them 130 lbs., which has been gradually increased to the 155 lbs. of the "Medea" class in 1887, and the same in the new vessels designed this year. The success of this type of engine has been most complete, both in the Navy and in the mercantile marine, where also it has been largely adopted with very satisfactory results, the actual saving of coal effected by the change being about 20 per cent. Not only in large sea-going vessels has it been adopted, but all new torpedo-boats have it also. In Nos. 79 and 80 already tried, triple expansion engines are fitted, and there are now building seven new first class torpedo-boats for our Indian marine, the engines of all being on this principle.

Although, in the case of the main engines, the first change of type from simple to compound took place as far back as 1872, it was until very recently entirely confined to the propelling engines of our vessels, the whole of the much smaller but very numerous auxiliary steam engines that occur in a large war vessel remaining as simple engines. To show how numerous and important in many cases these auxiliary engines are, those of the "Trafalgar" now building at Portsmouth may be mentioned. There are altogether in this vessel, besides the main propelling engines, fifty auxiliary steam engines with no less than 119 separate steam cylinders, and they would, if worked altogether, be capable of exerting more than 5,000 indicated horsepower. Of course they would not be worked all at the same time in practice, and many of them work only for very short periods. A detailed list of these engines with the power of each is annexed, the list being arranged in ascending order of power of one engine.

*H.M.S. "Trafalgar."**List and Power of Auxiliary Steam Engines.*

Engines.	No. in ship.	No. of cylinders to each.	Estimated I.H.P. Each.	Estimated I.H.P. Total.
Workshop	1	2	3	3
Drain tank pumping	2	1	3	6
Ash hoists.	2	2	10	20
Auxiliary circulating	2	1	12.5	25
" hydraulic pumping. .	1	2	16	16
Distilling condenser	2	2	17	34
Bilge engines	4	2	20	80
Starting	2	2	25	50
Turning	2	2	25	50
Exhaust ventilating fans	3	3	40	120
Pressure " "	4	3	40	160
Forced draught fans	6	3	45	270
Main feed pumps.	2	2	60	120
Auxiliary feed pumps.	2	2	60	120
Fire engines.	2	2	60	120
Air compressing.	2	2	62	124
Electric lighting ¹	3	4	80	240
Steering	1	2	122	122
Main condenser circulating ...	4	1	140	560
Boat-hoisting	2	2	280	560
Capstan.	1	2	400	400
Hydraulic pumping ¹	2	4	1,000	2,000
Total No. of engines.			50	
" cylinders.			119	
Total I.H.P.			5,200	

The engines for working the dynamo machines were the first of these auxiliary engines in which the compound system was introduced, they are so in several vessels now in commission. In a few recent cases in addition, the large hydraulic pumping engines are made compound, while still more recently the principle has been extended and applied to many other auxiliary engines where it could be conveniently done. The first vessel for which this has been arranged is the torpedo dépôt ship "Vulcan," where besides the engines for dynamos and hydraulic pumping, the fire, bilge, workshop, feed, circulating, and other engines are to be of the compound type. A considerable saving of fuel may be expected as the result of these changes among the small engines, and much has been realized already in the case of the dynamos, where the consumption of fuel has been very considerably reduced, which is, I think, to a very large extent due to the action of the Admiralty in instituting consumption trials, and placing a specified pecuniary value on reduction in steam consumption which is taken account of with the price in the considera-

¹ Denotes compound engines.

tion of tenders. This has stimulated a wholesome rivalry between the various makers with very beneficial results, the records of trials showing that the consumption of coal per electrical horse-power has been reduced during the last four years by at least 35 per cent. with the same type of dynamo and engine.

One great object of the various increments that have been made in the working steam pressure, and the changes of type of engine, has always been the reduction of consumption of fuel for a given power so as to enable a smaller weight of coal carried in the bunkers to be sufficient for steaming a certain distance. Many of the changes made with this object in view have tended directly to increase the weight of the machinery, but notwithstanding this a noteworthy feature of the machinery of the last few years is the great reduction that has been made in its weight per horse-power, which reduction, when coupled with the large savings in fuel owing to the increased economy of the engine, has enabled the speed of many of our recent ships to be largely increased. Although the fastest vessel of size yet tried is the "Rattlesnake" with a measured mile speed of about 19 knots, the estimated speed of many vessels now being built considerably exceeds 20 knots. 20 knots is the estimated speed of the "Medea" class to be tried this year, and of the torpedo dépôt ship "Vulcan." It is also to be practically the speed of the "Barham" and "Bellona." The seven torpedo gunboats of the "Sharpshooter" class will have a speed of 21 knots, while in the first-class cruisers "Blake" and "Blenheim," the speed will be 22 knots, all at their load draught. Our knowledge of the resistance of the various forms of vessels at different speeds is now much more complete than it used to be, so that it is anticipated with confidence that these designed speeds will not only be attained but possibly exceeded when proper screws have been determined.

In the Navy, for many years past, great attention has been paid to this question of reducing the weight of machinery, which in a war vessel is always of the first importance, and some very successful results have been obtained in this direction. The gradual reduction which has taken place in the weight of the propelling machinery is exhibited in the following table, where the weights are given for a series of representative vessels from the date of the introduction of the screw down to the present time. The vessels are divided into three groups of simple, ordinary compound, and triple expansion type, and it will be noticed that the first engines fitted on the compound and on the triple expansion principle are rather heavier than the last of the type immediately preceding.

The "Medea" may be taken as representing the latest practice as regards the machinery of fast vessels, where the special features of the torpedo-boat type are not adopted. Her machinery will weigh 630 tons for 9,000 I.H.P., or at the rate of 156 lbs. per I.H.P. The weight of the machinery of the "Sharpshooter" class is given for

Screw Propelling Engines.

Ship.	Date of trial.	Load on safety valves.	I.H.P.	Revolutions per minute.	Piston speed per minute.	Weight per I.H.P.			Remarks.
						Engines.	Boilers.	Total.	
Himalaya	1854	lbs. 15	2,046	56	feet. 392	lbs. 183	lbs. 282	lbs. 465	Early screw vessel, simple engines, and jet condenser.
Agincourt	1864	25	5,913	53	426	153	213	366	Simple engine and jet condenser.
Swiftsure	1869	30	4,913	68	547	148	152	300	Simple engine and surface condenser.
Alexandra	1875	60	8,498	66	528	175	173	348	Early compound engine.
Phaeton	1884	30	5,588	100.2	801	135	185	320	Later compound engine with ordinary draught.
Scout	1885	120	3,370	152	760	78	116	194	Compound engine with forced draught.
Morsey	1885	110	6,628	123.5	805	82	103	185	Compound engine with forced draught.
Galatea	1887	140	9,219	114	836	87	105	192	Triple expansion engine, forced draught.
Victoria ¹	1889	135	14,200	100	850	80	93	173	Triple expansion engine, forced draught.
Medea ¹ .....	..	155	9,000	140	910	71	85	156	Triple expansion engine, forced draught.
Sharpshooter class ¹ .	..	155	4,500	310	1,080	30	52	82	Triple expansion engine, forced draught. Modified torpedo-boat type.

¹ Weights as specified.

comparison, and it shows that with this modified torpedo-boat type, the weight of machinery is only about one-half that for the "Medea" type. The table also shows the progressive increase that has taken place in the working pressures of steam and in the piston speeds of the engines.

In the other part of the total propelling apparatus, viz., the weight of coal required to be carried for steaming a certain distance, as the result of the increased efficiency due to the use of high steam pressures and the improved type of engine, very considerable reductions have also been made. In the days of the first engines fitted to naval vessels, such for example as in the old paddle-wheel vessels "Salamander" and "Rhadamanthus," in 1832, the consumption of coal with their low pressure of 4 lbs. per sq. in., and no expansion, was about 8 lbs. per hour per I.H.P. This was gradually reduced, till in 1859 the consumption of the newest engines of that date, say, for example, the old screw vessel "Galatea" with the increased steam pressure of 22 lbs., was about 5 lbs. per I.H.P., both these vessels having the jet condenser. The adoption of the surface condenser came soon after this, the pressure of steam still rising, and as a later example we may take the "Thunderer," tried in 1872 with surface condensers, an increased steam pressure of 30 lbs., and a fair amount of expansion carried out in the cylinders. Her consumption at ordinary cruising speeds may be taken at about $3\frac{1}{4}$ lbs. per I.H.P. per hour. All the preceding vessels have simple engines. In the compound engines which came immediately after the date of the "Thunderer's" trial, the consumption of coal was again greatly reduced, due to the combined effects of an increased steam pressure, and the compound system. The consumption in these at cruising speeds may be taken at $2\frac{1}{4}$ lbs. per I.H.P. per hour, while by the increase of steam pressure to 150 lbs. per square inch, and the adoption of the triple expansion engine, the consumption of fuel has been brought down to about $1\frac{2}{3}$ lbs. per I.H.P. per hour.

As examples showing clearly what these reductions of weight of machinery and consumption of coal mean as regards enabling the offensive and defensive powers of war vessels to be increased, the effect on such armour-clads as the "Thunderer" and "Superb," if they were to be refitted with modern machinery instead of that at present on board, may be mentioned.

In the "Thunderer" the present machinery consists of a set of simple low-pressure engines of about 6,000 I.H.P., the weight of machinery being about 1,010 tons, coal carried 1,350 tons, giving the vessel a coal endurance of $17\frac{1}{2}$ days at 10 knots. Supposing new machinery of the triple expansion type to be fitted, with the increased power of 7,000 horses, and a working steam pressure of 150 lbs., the weight of the new machinery would only be about 730 tons, so that the saving of weight effected under this head would be about 280 tons. Also, as the consumption of fuel with the new machinery would be only about one-half that with the present, the same radius of action would be secured by carrying only about 700 tons of coal, thus effecting an additional saving on coal for the same radius of action of over

600 tons. The total saving of weight, therefore, for the whole propelling apparatus would be nearly 900 tons, with which a considerable addition could be made to the efficiency of the vessel.

In the case of the "Superb," which has a set of old low-pressure simple engines of about 6,500 I.H.P. with a weight of 1,140 tons, new machinery of the triple expansion type, with an increased power of say 8,500 horses, could be fitted, at a weight of only 840 tons, so that a reduction could be effected of 300 tons, and with the new engines the distance the vessel could steam with a certain quantity of coal would be doubled. In such cases as these, too, the saving in cost of fuel per annum would be considerable.

Mentioning next the boilers, the most important development that has taken place is the adoption of the plan of increasing the rate of combustion in the furnaces usually known as the "forced draught." The practice of forcing the fires by artificial means beyond the rate given by a chimney has been very common in the past. For many years the "steam blast" was always fitted to naval boilers for this purpose, a jet of boiler steam being injected at the base of the funnel which by its rapid expansion displaced the funnel gases and caused an increased flow of air through the fires. This was a very simple plan, but there are several objections to it—the loss of fresh water from the boilers which this plan involves is in these days of high-pressure steam inadmissible; it was also very wasteful of fuel, as the steam acted directly on and in contact with the body of the gases to be displaced, and there was often severe local corrosive action on the funnel in the neighbourhood of the blast orifices. These objections have been long recognized, and it was for many years inserted in the Admiralty specifications that the full power on trial was to be developed without the use of the steam blast, although it was always fitted so as to be available in case of emergency.

The method now adopted for obtaining an increased rate of combustion consists in closing in the ends of the boilers practically airtight by a system of screens, and forcing into the space thus obtained a plentiful supply of air by means of steam fans, so that there is an air-pressure in the stokeholds sufficient to balance the weight of about 2 inches of water. This moderate pressure of air is found to be sufficient to cause the rate of combustion of fuel to be very materially increased, with the result that a largely increased power can be obtained from the boilers. The particular system adopted for working under air-pressure is known as the "closed stokehold" system; it is the same plan as used in all our torpedo-boats where its first application occurred. It has been known on a small scale for a long time in these boats, where its success caused a trial in the larger vessels, and it has now been, without exception, adopted in all recent war vessels. The details of the system in the torpedo-boats have already been recorded in the *Journal of the Institution*.¹ There are other plans of applying air under pressure to the boilers, but not any others are so simple and so well suited to the requirements of war vessels as the system we have adopted.

¹ See *Journal*, vol. xxv, No. 111. 1881.

In Mr. Sennett's paper, previously referred to, mention was made of the results of the experimental trials of the system in the "Satellite," a sloop of 1,500 tons, and about 1,500 I.H.P., where it was found that the production of steam from the boilers was very easily increased by 55 per cent. with an air-pressure in the stokeholds equal to a weight of only 1 inch of water. Since these trials showed the practicability of the system for vessels much larger than torpedo-boats, it has been fitted to all subsequent war vessels, it being very well suited to their requirement of having a reserve of power available for use at any time, the reserve being by this method carried in a few light fans instead of in more numerous boilers or boilers of larger size.

There are several other advantages resulting from this system of working which are also of importance. The ventilating pipes with large cowl-heads, which are necessary with natural draught, but which are generally objectionable and interfere with the deck arrangements, can be mostly dispensed with, and the requisite openings through the deck, which it is always necessary to keep as small as possible, can be reduced to a minimum. The power of the ship, too, is practically independent of the force and direction of the wind, which is of great importance in some climates, and the stokeholds are always cool and well ventilated.

I will just mention the results recently obtained, and others expected very shortly, in its application to modern vessels of large size. With the ordinary funnel draught the average of many results of trials just prior to the introduction of the new system was that about $10\frac{1}{2}$ I.H.P. were obtained per square foot of grate, and 12 I.H.P. for each ton of boiler-room weights, while with the forced draught, in those vessels with compound engines which are comparable with the ones previously mentioned, the results obtained have been about 16 to 17 I.H.P. per square foot of grate, and about 20 I.H.P. per ton of boiler-room weights, which represents an increase of power of boilers of 66 per cent. From these trials of the compound engines it was inferred that with the triple expansion type at least 20 I.H.P. could be obtained per square foot of grate, and about 24 I.H.P. for each ton of boiler-room weights. The recent trials of the "Victoria," in June last, have shown that these expectations will be fully realized. These engines developed an average of no less than 14,200 I.H.P., which is at the rate of $20\frac{1}{2}$ horse-power per square foot of grate, and 24 horse-power per ton of boiler weights. The maximum power developed was 14,800 I.H.P., or $21\frac{1}{2}$ per square foot of grate. In some of the fast cruisers now building further steps have been taken in the direction of reducing the weight of the boilers, and in these about $26\frac{1}{4}$ I.H.P. was expected per ton of boiler when the designs were prepared, but the trials of the "Victoria" referred to above indicate that this result may be considerably exceeded.

In order to keep the weight of the boilers within limits, the amount of tube heating surface fitted in them, compared either with the grate surface or the maximum power required, is comparatively small, so that a considerable quantity of heat escapes owing to the high

temperature of the funnel gases, which it is impossible to abstract. This is unavoidable at the maximum power, and it will no doubt be felt still more in the future, for it is probable that, as experience shows to what extent it is possible to reduce the amount of tube heating surface by which a large power can be obtained for a moderately short time, economy at the maximum forced draught power not being the first consideration, this reduction of tube surface compared with the horse-power will be made so as to enable the size and weight of boilers to give the maximum power to be still further reduced. We have some vessels now with only 1.3 square feet of tube heating surface per I.H.P.; on the trial of the "Victoria" last month under 1.2 square feet were sufficient, and in some torpedo-boats it is as low as 1 square foot per I.H.P. with compound engines, so that the proportion might no doubt be reduced to 1 square foot per I.H.P. with our triple expansion engines, without fear of failure to obtain the power, retaining, however, the amount of grate surface at present being fitted. A still higher funnel temperature, and greater waste by heat discharged up the funnel at full power, will be the result. At the specified full power without forced draught which is practically the full power at sea for continuous steaming, and at other moderate powers, however, the conditions are entirely different, and compared with the horse-power required then, the heating surface in the boilers is always fairly large, the true measure of the extent of heating surface in a boiler being the ratio of its area to the amount of coal burnt, and not its ratio to the grate surface. Economical results can thus be obtained at these moderate powers, and the quantity of coal carried is based on the consumption under these latter conditions.

As regards the effect of the introduction of the forced draught on the coal consumption, theoretically a system of burning the fuel by a powerful blast of air should have the effect of limiting the amount of air, always considerable, which passes through the fires to the atmosphere without assisting in the combustion of the fuel, but simply carrying away and wasting a certain amount of heat, and is therefore conducive to efficiency. In practice, however, at any rate, under the circumstances attending full power trials, where the *quantity* of coal burnt fairly economically must be the first consideration, this benefit can hardly be expected to be realized, and the consumption of fuel is found to be about the same as it would be in boilers with the same amount of heating surface if worked by an ordinary funnel draught only. But when working at lower powers, if the fans were kept running so that the supply of air could be properly regulated, we know that a gain in economy should be experienced through their use.

In the works of the late Professor Rankine, a convenient formula is given for the efficiency of a boiler under various conditions, which has been found by experience to give fairly accurate results. Let us suppose one boiler of the "Medea" being used for generating a low power of only 560 horses when cruising at a low speed, instead of the full power of 2,250 horses, the whole of the grate surface of that boiler being used with a very slow rate of combustion, the power generated

then would be at the rate of 5 I.H.P. per square foot of grate. Under these conditions the expression of Professor Rankine places the efficiency of the boiler at about 79 per cent.

Next, suppose that only the two centre fires of the six furnaces are used, the wing furnaces being closed up, and the fans allowed to run at a moderate speed so as to produce the same power. Under these conditions 15 I.H.P. would be generated per square foot of grate, the amount of heating surface being practically the same as before. This would only be a very moderate forced draught, but under these altered circumstances the efficiency of the boiler would be increased to 86 per cent., that is, a gain of about 9 per cent., which would have an important influence on the coal endurance of the vessel. This could of course only be done in a boiler having a common combustion chamber.

As regards the boilers themselves, however, there has been no improvement for very many years in its *efficiency* as a generator of steam from coal, although its power has been very greatly increased, in fact in the former respect there is no doubt that the present form of boiler with circular furnaces often of small diameter is inferior to the old type with roomy rectangular furnaces, in which much more space could be obtained for the intimate mixture and combination of the gases, with a resulting gain in efficiency.

With the present triple expansion engine and steam pressures of 150 to 160 lbs. per square inch, it is certain that for large boilers of the present type, any increase of steam pressure would result in an increased total weight of machinery, owing to the increased weight required for the boilers being more than would be saved by the reduction in size of engine, and the gain in economy through the increased pressure, if the present type of engine were retained, would be very small. Also any endeavour to again increase the efficiency of the engine by changing the type to the "quadruple expansion" would be of little use unless accompanied by a considerable increase of steam pressure. The power of modern vessels has to be concentrated in large boilers, owing to the limitations of space and weight, and it appears as if no very considerable increase of working pressure were practicable with our present materials and type, for the shells of these large boilers would become too thick to be properly worked.

Another feature of the last few years has been the trial again of what is generally called the *tubulous* boiler, in which the steam is generated by the hot gases in contact with a series of tubes only with the omission of the shell, furnaces, and combustion chamber of the ordinary boiler. This type of boiler offers great facilities for obtaining safely any increase of pressure that is likely to be wanted, the water being inside small tubes, and the material distributed in the best possible form for resisting the pressure. Large numbers of so-called tubulous boilers have been designed, but the working of most of them has not been very successful, especially in the mercantile marine; lately however they have been used with more success than formerly. We have in the past learnt much from the makers of torpedo-boats, and a successful example of this type of boiler was fitted on our second-class

torpedo-boat No. 100 by Messrs. Thornycroft and Co., tried in 1886, and has since given satisfactory results. Similar boilers have been fitted on some foreign torpedo-boats, and three of the first-class torpedo-boats now being built for the Indian marine are also being fitted with it. Messrs. Yarrow have also designed and tried at their works a form of tubulous boiler which promises to be successful, but it has not as yet been fitted to any vessels.

I do not suppose that tubulous boilers will soon be fitted to our larger vessels with the present pressures, especially where several would be required, on account of the difficulties in working these boilers in combination, there is, in fact, no necessity for them at present; but it appears that if any considerable increase of pressure be desired, some such form may become indispensable. In the French Navy, a similar form of boiler on the Belleville principle has been fitted to some cruisers, and so far as is known, has given satisfactory results.

In our new vessels, double-ended boilers are now used both for economy of weight and saving of space. These are necessarily very long, and with the high temperature of steam now used, any considerable differences of temperature between the various parts of the boiler lead to unequal expansion and severe strains, and for this reason all such boilers are now provided with feed water heaters, which raise the temperature of the feed water considerably from that at which it is delivered from the condensers, before it is permitted to enter the boiler.

All the boilers for the fast cruisers recently designed are on this principle, including those for the "Blake" and "Blenheim." These latter will be the first double-ended boilers fitted in our vessels with four furnaces at each end. They will be the largest and most powerful boilers we have, each of them generating sufficient steam for 3,350 I.H.P.; their dimensions are over 15 feet in diameter and 18 feet long, and to prevent these very large boilers being used for the ordinary harbour work of the vessel, such as for electric lighting, distilling, and drill purposes, an auxiliary boiler with two furnaces is fitted in one of the boiler compartments.

In connection with the boilers, the adoption of an important fitting may be mentioned, which is a sequel to the surface condenser, and an extension of the same principle. This fitting is what is known as the double distillation condenser. The adoption of the surface condenser caused the main body of the boiler feed water to be changed from salt to fresh, but a certain percentage of the feed water being always lost during its transit through the engine, this deficit of feed water was until very recently made up by sea water, the scale from which at the high temperature of the steam is left in the boiler. When distilling fresh water for drinking purposes also, with the old form of distiller, a large quantity of scale was unavoidably deposited in the distilling boiler. With the modern marine boiler, however, this occurrence is most objectionable, and to obviate it, the particular form of distiller mentioned has been adopted, in which the evaporation takes place in an intermediate vessel between the boiler and the

fresh water condenser, and in this intermediate evaporator the scale is deposited, the arrangements being such, that it can be properly cleaned out and dealt with. The generation of steam in the evaporator is caused by the condensation of steam from the main boiler in or around tubes, and this condensed steam is returned to the boiler. By this means, nearly all the scale will be kept out of the main boilers, a supply of fresh water being obtained sufficient to make up the loss which occurs when cruising at ordinary speeds.

One of the principal points to be attended to in the design of engines for modern war-ships is the fact, that while they have to be capable of obtaining a high maximum speed when required, yet most of their steaming is done at much lower speeds, and at powers very often less than one-tenth of the maximum, and the engines must be capable of working economically at these low powers, or else the coal required is seriously affected. The disproportion between the maximum power and the power required for ordinary cruising has become of late very great, and as showing how the limits of power between which the same set of machinery has to work well have been constantly widening, the following examples are given, going no further back than about ten years:—

Table showing the Ratio of Full Power to Ordinary Cruising Power.

Ship.	Date of trial.	Displacement.	Full power.	Full speed.	Per cent. of full power required at 10 knots.
		tons.	horses.	knots.	
Téméraire	1877	8,540	7,520	14·6	28
Iris	1877	3,730	7,330	18·0	18
Inflexible	1878	11,880	8,010	13·8	33
Nelson	1878	7,630	6,640	14·0	31
Amphion.....	1884	4,300	5,500	16·5	19
Mersey	1885	4,050	6,000	17·0	16
Curlew	1886	950	1,500	14·5	28
Archers	1886	1,770	3,500	17·0	19
Grasshoppers..	1887	525	3,000	19·0	13
Victoria.....	1888	10,470	14,200	17·25	12
Sharpshooters..	} not yet tried	735	4,500	21·0	16
Vulcan		6,620	12,000	20·0	8
Medea class....		2,800	9,000	20·0	7
Blake.....		9,000	20,000	22·0	6½

In the "Blake" and "Blenheim," first-class protected cruisers, of 9,000 tons and 22 knots speed, now building, the maximum power being very large, namely, 20,000 horses, while the power required for the 10 knots speed is only about 1,300 horses, or 6½ per cent. of the maximum, a decision has been come to which will greatly increase the efficiency of their engines at low speeds. In these ships four sets of triple expansion engines will be fitted, two sets on each of the twin

screw shafts, and to secure minute subdivision and protection of the vessel, these four are in separate engine-rooms. The forward sets of engines on each shaft are arranged so that they can be disconnected from the after sets, and at low powers only the after engines will be worked, and one-half the constant friction of the engines removed altogether; under these circumstances the speed of the vessel would be about 16 or 17 knots, while as regards further reduction of power and speed to those which would be used on ordinary occasions, the ship will be under far more favourable conditions than would have been the case had the maximum power of 20,000 horses been developed by two sets of engines only.

An important point as regards the arrangement of the engine should be next described. The old paddle-wheel engines being to a large extent necessarily exposed to the risk of damage in action, the vertical engine was generally used for these; but when the screw propeller was introduced, and it became possible to have the whole of the machinery protected, the vertical engine was abandoned, and the horizontal type was invariably used for many years. In those few early screw vessels in which engines of similar speed to those of paddle-engines were fitted, with gearing to obtain the increased number of revolutions of the screw, the vertical engine still remained, but these were very few in number, and, as before mentioned, the natural plan of running the engine at the same number of revolutions as the propeller was soon adopted. From this date, about 1850, the horizontal engine has an unbroken record in large fighting vessels for about twenty-five years, all vessels of this class being fitted with them, till we come to the "Alexandra," "Dreadnought," and "Téméraire," designed about 1873, in which cases the vertical engine was introduced, and these were the first large fighting vessels so fitted since the days of the old paddle-wheels. The disadvantages of the horizontal position are that the pistons and reciprocating parts are of great weight, and borne to a large extent by the rubbing surfaces of the piston and cylinder, so that great wear takes place at the part where it is of the greatest importance to retain an accurate and perfectly steam-tight joint, and this must cause loss after the engine has been running for some time, by the direct passage of steam past the piston when worn. In the modern engines on the triple expansion principle this action certainly occasions loss in a much less degree than with the old simple engines, but the vertical position is the most natural for an engine, it avoids this uneven wear of cylinders, all its parts are more accessible for examination and repair, and the engine can be kept in an efficient condition much more readily than if horizontal. The weight of the pistons and other reciprocating parts in this case are taken at the main bearings, which are constructed especially for such work. These advantages of the vertical engine and others, such as facilitating the watertight subdivision of the vessel, caused them to be fitted in the "Alexandra," "Dreadnought," and "Téméraire," the cylinders being efficiently protected by the side armour fitted.

Since its introduction into these vessels the vertical engine has,

without exception, been fitted in all first-class battle ships, and in the first-class cruisers. One noteworthy feature of naval engineering in recent years is this more extended use of the vertical engine, a step which has been of great importance in adding to the prolonged efficiency of the propelling machinery, especially of those high speed vessels now becoming so general. During the last year or two a further important step in this direction has been taken by fitting vertical engines in the "Medea" and "Medusa," second-class cruisers of 20 knots speed, commenced in 1887, they having been up to that time excluded from the vessels of the cruiser class, except the largest. Since this time it has been very generally introduced into most recent vessels of that class, and it cannot be questioned that the efficiency and durability of the propelling engines of these vessels have by this means been materially increased.

There are many other interesting points in connection with the machinery which I have not been able to mention within the limits of this paper, and of those portions I have described, I cannot hope to have given more than an imperfect review.

Mr. DONALDSON, C.E.: I have listened with very great pleasure to the interesting paper which has just been read, and I think the Institution is to be congratulated when gentlemen like Mr. Oram, who know so thoroughly Her Majesty's ships and their machinery, and who have access to the results of experiments made thereupon, come forward and give members the benefit of the experience so gained. I was struck on looking at Table I to find the enormous amount of horse-power required to drive the auxiliary engines; it very nearly amounts to one-half of that required for driving the ship. Of course it would not be all used at once, but a good deal of it will be used constantly, whether the ship is in harbour or at sea. Part of it will be used intermittently when leaving harbour, when in action or when exercising the crew, and another part always when the ship is under way; so that the average I.H.P. used is high, and the coal consumption due to this will form a very considerable item in the coal consumption of the ship. Now, I should like to ask Mr. Oram if, in estimating the radius of action, this coal consumption is deducted from the total bunker capacity of the ship, and the balance only used in the calculation. If this is not done the "radius of action" becomes merely a comparative estimate, or simply a means of comparing the efficiencies of different ships—and even then it is somewhat fallacious, seeing that some ships require larger auxiliary engines than others, and that there is such a difference in economy between the simple and compound engines. This difference will be reduced, and the economy increased in the future by the extended use of compound engines. I should like to ask also if the auxiliary machinery has been taken into consideration in Table II, where the weights of the machinery of the older ships are given in comparison with that of the newer. In the older ships I think I am right in saying that the feed-pumps, the air and circulating pumps, and so forth, would be included in the weights of the main engines, whereas in the newer ships (such as the "Trafalgar" and the "Nile") they would be put into the class of auxiliary engines. If this is the case, Table II scarcely gives an idea of the actual reduction of weight that has been brought about of late years. With regard to the boilers, Mr. Oram has mentioned No. 100 second-class torpedo-boat built by my firm two years ago, and says the boiler has since given satisfactory results. I am very glad to hear this, as it corresponds with the experience of foreign Governments for whom we have made a considerable number of these boilers. In the case of one Government I may say, after fitting two boats with these boilers, we have fitted or are fitting as many as sixteen, including the first for torpedo- and patrol-boats. In the case of No. 100 we have a good basis for comparison, as we then built two second-class boats of the same size—one fitted with a locomotive boiler and the other with a

tubulous boiler, the result being a reduction in displacement in the case of the tubulous boiler, and a considerable increase of efficiency, the speeds on the final trials being 16·1 knots in the case of the locomotive boiler, and 16·81 in the case of the tubulous boiler. Recently we have fitted one of these boilers in the Baroness Rothschild's steam yacht "Gitana" to replace a locomotive boiler which was fitted originally in the ship, and I have brought photographs of this boiler which it may be interesting for gentlemen present to see. In the case of the locomotive boiler the total weight was 8·12 tons, and in the case of the tubulous boiler 7·25 tons, with a very considerable reduction in the length occupied by the machinery. In the matter of steam pressures, the Admiralty seems very much behind the age, as we are now using 200 lbs. per square inch in first-class torpedo-boats, and in some second-class boats which we are building we are going to use 250 lbs. This is a considerable increase on the maximum pressure of 155 lbs. as given by Mr. Oram for the "Medea" and "Sharpshooter." With regard to the speed of the "Sharpshooter" type of boat, I may say that we have already offered the Admiralty a boat in which we guarantee a speed of 27 knots an hour, and hope to attain 28. This vessel would, I think, be very much more useful as a torpedo-catcher than one having a speed of 21 knots. No large vessels have as yet been fitted with these boilers, but it would be well if the Admiralty were to consider the question of fitting tubulous boilers in the next small ships they have to refit with boilers. A large part of the expense of refitting ships with boilers consists in the tearing up of decks and the alteration of fittings. With our boiler the old boiler could be cut out below and sent up piecemeal, and our tubulous boiler could be sent down piecemeal and erected without disturbing the decks at all, which would be a very great saving. The horse-power per ton of boiler would also be very much increased. In the "Victoria" it seems to be something like 24 horse-power per ton. In some of our recent torpedo-boats we have gone as far as 77½ horse-power per ton—a little over three times the result that has been obtained in the "Victoria." Of course we cannot compare torpedo-boats with big ships, but still, I think, in this matter of boilers we might effect a considerable improvement. I am very glad to hear from the paper that Mr. Yarrow is experimenting on tubulous boilers: it seems to show, notwithstanding all that has been said in various publications as to the value of the locomotive boiler, that he is not quite satisfied with it, and is seeking after better things.

MR. DUNCAN: I should like to point out the very great advantage that we now possess in using high-pressure steam, *not* only with regard to the economy of fuel, but also with regard to the handling of engines. I remember, in the year 1863, when we had engines for the "Caledonia" and other ships to try, it took us three minutes to blow through the condensers, and it took three men to reverse each of the engines, and in all eight men to get the engines off. Now we can start the engines with one man and reverse them in about four seconds. There is one thing Mr. Oram has justly lauded very much—that is the surface condenser; but he says nothing of the important question of getting rid of the oil out of the boilers which it seems to me at present has not been dealt with very satisfactorily either to the Admiralty or anyone else. I should like to know very much if Mr. Oram will enlighten us upon that. Then with regard to the feed-heaters. It seems to me at present the feed-heating apparatus as composed consists mainly in heating the feed-water which comes from the condenser with live steam from the boilers, and does not tend to much economy. All you get thereby is to send water into the boiler hot, avoiding any undue strain from cold water. On the other hand, you get an immense amount of heat going straight up the chimney when working forced draught. It seems to me it would be quite worth the Admiralty's while to consider whether they could not put the feed-heating apparatus in the chimneys where you would utilize some of what is now waste heat. It is quite true in putting a number of tubes in the chimney you would somewhat cripple the natural draught, but seeing you have the fans which might be worked always at a very moderate number of revolutions per minute, you would overcome any difficulty of friction in the uptake, and you would get the advantage of raising the water from about 100° to as high as 250° without much trouble in a proper feed-heater in the lower chimney. It was done in the "Great Eastern" steamship, but they had unfortunately omitted to fit a safety-valve, and it blew out.

The CHAIRMAN: The objection would be in action.

Mr. DUNCAN: It would be in the roof of the chimney below deck, and out of fire. I regret very much that Mr. Oram said he thinks quadruple expansion engines are not coming on. I had great hopes of seeing the Admiralty make a further stride, as quadruple expansion has already crept in in various places, and the North German Lloyd Company has obtained already a very successful result with a pressure of 200 lbs. I think our weights might be kept down seeing that there is a saving of from 15 to 18 per cent. still to be got. I congratulate Mr. Oram on his interesting paper.

Captain W. H. HENDERSON, R.N.: There are one or two questions I should like to ask Mr. Oram. I feel great diffidence in speaking on this subject to engineers, who understand thoroughly the whole of the business, but still I should like to ask whether the great advance in piston speed has been such a very great advantage, the friction and wear and tear of the machinery being increased enormously by it. My experience is that what our engineer Officers complain of whenever you are going to have the full-speed trial is the number of revolutions; they always say when you begin to work up the maximum number of revolutions the strain on the engines is so great that things are sure to come to grief, and that that is the cause of many small breakdowns and failures which we have in so many ships at the critical moment. The difference between making a passage in a passenger steamer and the effort of a man-of-war to keep her sea speed is very marked. Of course I know about the length of stroke, the height of the cylinder above water, the greater capacity of the cylinders in consequence, and the necessity of putting a certain quantity of steam through the cylinders in a certain time to get the power. I have come here from the Straits of Magellan upon one of the large ships of the Pacific Steam Navigation Company. You find the engines going on steadily as many days as you like at an average number of revolutions—50 to 53—driving the ship steadily through the water. On the other hand, whenever we begin to press our ships or to attempt to get anything more than very easy speed out of them, you find the whole engine-room is, so to speak, capsized by the enormous strain which is put upon everybody connected with it. You do not do it quietly, you do it at a strain and pressure which is a very bad condition for a ship to be taken into action in. Therefore I think we should get more space for engines and boilers. Cannot something be done in that way?

Mr. ORAM: Weight! You want more weight.

Captain HENDERSON: Increased length. I said the same the other day here. Every sailor knows that these cruisers building now are much too short to get any speed at sea. When you come to a head sea you cannot put them at it, and what we want—nearly all naval Officers wish or want—is that the ships should be lengthened. Well, if these ships were lengthened you get in the centre of the ship a considerable extra space which may be used for boilers or coal bunkers. There is one other question connected with the ships. I do not know exactly whether it is an engineering question or a construction question, but it is the coal supply. In merchant ships, which have a great big box of coal probably between the boilers in the centre of the ship, the coal supply is easy: but, for the sake of protection, the coal supply in a man-of-war is divided about the whole length of the boiler and the engine space, which is nearly half the length of the ship. The consequence is, after the first two days' steaming the whole of the coal has to be dragged down from both ends of the ship, and requires an enormous number of men to do it, and a much greater number of men than your engine-room staff is sufficient for. The consequence is, whenever a full-speed trial is about to take place, for after a few days' steaming, you are obliged to send hands from on deck down to the engine-room in order that the stokers may have sufficient coal for trimming the fires. It is a very great defect in ships at present is this want of handy coal supply. Of course my own idea is to only build the ships a little longer—cruisers I am speaking of—and put that length into a big coal-box in the centre of the ship, and you will get over it; but it is to the steaming efficiency of the ship a very great defect having to trim nearly the whole of the coal from the ends of the ships, and having it in these small spaces. I think one thing of very great importance to be considered is the coaling of ships. The arrangements for coaling ships are very bad indeed. I

have no hesitation in saying so bad that there is hardly a ship in the Service that can fill up with coal under twenty-four hours, and perhaps even longer under our usual methods, and the ship after she is coaled, from this very fact of distributing the coal all over the ship, is in such a dirty state that she is unfit to go into action for another twenty-four hours. You cannot expect a ship which has just finished coaling, with every single thing covered with coal-dust, and filthy dirty, that she can go into action until she is cleaned, and if you take twenty-four hours to coal and twenty-four hours to clean the ship that means that a ship withdrawn from blockade is *hors de combat* fully forty-eight hours, which I think is rather longer than ought to be. I think what Mr. Donaldson said about radius of action, and the amount of coal consumed for the engines, is very important. In my opinion as a naval Officer the coal-carrying capacity of these cruisers is not sufficient. If you have to deduct largely for the use of auxiliary engines from a very small coal supply, for practically, although it appears as 400 tons on paper, it is not really that. I know that where we have to look to for improvement is in the boilers. I take it the engines have improved enormously, but the boilers require improvement, and it is quite probable our next advance will be towards saving some of the waste heat which now goes up the funnel. I should like to ask Mr. Oram whether he knows anything about hot air, whether instead of the closed stokehold system, making use of superheated air—heating air in the funnel and then blowing it or admitting it into a closed ash-pit, is not likely to offer better results than the closed stokehold?

The CHAIRMAN: I think we may generally divide the papers that are read in this Institution into two classes—those which bring before us new theories or new inventions which are in some degree speculative; and the other class, which to my mind is very often the most useful of the two, which generalizes from proved facts and gives us summaries of the position of the matériel with which the Service has to do. Amongst those papers, I think we shall all agree that Mr. Oram's will take a very high rank. I have not heard many papers that have generalized so well, so ably, and so clearly as this paper has done, showing us, especially in these tables, in various ways, the progress that is being made, and the direction in which the progress is being made. It is very important for naval Officers who are not engineers to carry about ordinarily in their minds the direction in which progress is going; it prevents them from expressing wrong opinions which they might otherwise express did they know in what direction progress was being made and succeeding, and in what direction attempts were being made which were more or less failures. The case of reduction of weight shown in the tables is certainly very remarkable, but I think there seemed to be a great deal in what Mr. Donaldson said. Mr. Oram will explain to us no doubt, when he comes to reply, if it is the case that the auxiliary circulating engines, for instance, the starting and turning engines, are not added in the general weights with other engines of that sort. There is one thing I wish Mr. Oram had not said—I am always afraid of it—that is, where he shows that by means of this reduction of weight in the new patterns of machinery and boilers we are gradually getting down the coal consumption—as he pointed out, to $1\frac{3}{4}$ lbs. I think it was—per horse-power. The tendency is to say “Very well, we will carry so much less coal and save it that way.” I think the gorges of naval Officers rise when they hear of coal supply being cut off. We do think universally that any advantage which is given in the way of reduction of consumption of coal should be kept to us, and that the quantity of coal carried should not be reduced; that the area of action should be extended, and we should not attempt to say that we are going to have a certain area of action, and that all without that we shall cut off from the coal supply. I wish he had not put it exactly as he has in that paragraph on that account, because it a little encourages the idea. I agree with Captain Henderson that it looks now as if those who—as the lecturer has pointed out—originally thought that the advance would be made in the generation of the steam have not been so far out after all. It may be perfectly true that attention was turned to the improvement of the engines which has given us the great results which have been put before us, but that we have not wholly lost sight of the improvement of the generation of the steam, and that now if we have come, as we seem to have come by the lecturer's

remarks, to a sort of platform on which the engines may rest for a time, that universal attention will be turned towards the generation of the steam. I look for a great future for the tubulous boiler; I look to its being largely extended. Mr. Donaldson's remarks struck me very much; the increase of speed which he is going to get out of it in the first instance is a tremendous improvement—the jump from 22 to 27 knots that he speaks of.

Mr. DONALDSON: We have done over 26.

The CHAIRMAN: I was especially struck with these remarks about the power of replacing a boiler without pulling a ship to pieces. The "Thunderer" and "Superb," the two ships which Mr. Oram has used as illustrations, are, I believe, about to be pulled to pieces, and I presume we shall lose their services for a year and a half or two years before that is completed, and a great part of it arises from the necessity of pulling the whole ship to pieces in order to replace the boilers. If we could put them in piecemeal and take them piecemeal out no doubt the process could be made very much more rapid. Mr. Duncan spoke about the heater in the chimney. I should doubt whether you could get it sufficiently close down to have it protected in action. It must be some height above the boilers I take it.

Mr. DUNCAN: Not necessarily.

The CHAIRMAN: I should like to confirm what Captain Henderson said about the short ships. I do not think we ought ever to leave off urging the importance of not shortening the ships. There was a grand mistake made in years gone by when it was assumed that manœuvring power and length went together. There is no more connection between manœuvring power and length than there is between manœuvring power and helm-angle or rudder area, or disposition of weights, or any of the elements which go to make manœuvring power. Manœuvring power does not depend upon length more than upon any of the other elements which go to make it. The only other reason for retaining short ships is that you get greater displacement at a cheaper rate. We should be properly spending money in order to get the length which will give us real speed, and not speed which is good in smooth water and not so good in other water.

Mr. ORAM: In reply to Mr. Donaldson, I may state that the coal for the auxiliary engines that would be working has been allowed for in estimating the coal-endurance of the vessels, and also the coal required for culinary purposes.

The CHAIRMAN: It was the weight.

Mr. ORAM: And also in the table of weights the vessels are quite comparable. In all these modern ships the weights I have given do include the weights of feed-pumps, bilge-pumps, &c., which are also included in the old vessels. I think the speed of 26 knots that Mr. Donaldson mentioned is a torpedo-boat speed.

Mr. DONALDSON: That is so. We have a torpedo-catcher at 27.

Mr. ORAM: But in this paper I have confined myself to the results obtained in vessels of some size. Next, as regards Mr. Duncan's point respecting the oil in the boilers, its presence there is no doubt most objectionable, but in the Navy we have not experienced much difficulty with it. I believe, however, the solution of this difficulty will be found in not using any oil at all for internal parts. We shall come to that I think by-and-by. They do not use any in torpedo-boats. In the adoption of the feed-heater we have not been influenced by economy at all. It is simply the question of temperature and lessening the stresses on the boilers; but I daresay we might use some such form as is proposed by Mr. Duncan, although it would be rather in the way at full power, while at low powers the amount of heat escaping is not large. Then, in reply to Captain Henderson on the question of the piston-speed of the engines, if we make their weight greater we can give you engines that will run at a much slower speed. It is not our own choice, but we are forced to have a high piston-speed by the necessity of producing vessels of high speed. By increasing the revolutions we get a much more powerful engine and a smaller one. It is quite necessary unless some other feature of the ship be sacrificed. With respect to Captain Henderson's remarks as to increasing the length of the ship, increasing the radius of action, and the arrangement of the coal in the ship, these are matters of ship design which it would be beyond my province to discuss. As regards one point mentioned, viz., the radius of action: the engineer does not settle what it should be, but simply being given this, he can decide the coal which she should carry or vice

versé. With reference to the closed ash-pit system which has been mentioned, it has been discussed over and over again before various other societies, and I won't take up any more time than simply to say that it has been fully considered at the Admiralty, and we have adopted this particular "closed stokehold" plan as being the best, and we believe it is the best, for war ships. Respecting the tubulous boiler, I quite believe that we shall come to some boiler of that kind by-and-by, but there are some difficulties in the way, as I mentioned, in connection with working these boilers in combination. I think they are real difficulties at present, but I daresay they will be overcome by-and-by. There is no difficulty when you have one or two, but when you come to more than two there are difficulties. The water carried in these boilers is so little that variations in delivery of feed-water, and in the rate of generation of steam, become very important, and would cause dangerous fluctuations of the water-level. I think that is all I need say in reply, except to thank you very much for the attention with which you have listened to my paper.

The CHAIRMAN: I have to put it to you that we offer Mr. Oram our thanks for his most able and interesting paper.

THE MILITARY DEFENCES OF VICTORIA.

By Major T. R. DISNEY, R.A., late Commandant Victorian Military Forces.

As a preface to my remarks on the military defences of Victoria, it may not be out of place to give a few particulars as to the Colony generally.

Victoria is the southernmost Colony on the mainland of Australia, and lies between the 34th and 39th parallels of south latitude and the 141st and 150th meridians of east longitude. It is bounded on the west by South Australia, north and north-east by New South Wales, south and south-east by the Southern Ocean, Bass's Straits, and the South Pacific Ocean. It has an area of 87,844 square miles, and a population which on the 30th June, 1887, was estimated at 1,019,106, or nearly one-third of the total population of the whole of Australasia. It has a climate which, while not perhaps quite so superlative as it is generally described, is better than that of any of its neighbours, Tasmania excepted, and one in which the English race appears likely to flourish. The heat between November and March is sometimes very great, I have known it up to 104° F. in the shade in Melbourne, but it is never continuous, and after three or four very hot days the wind generally goes round from the north (from which quarter it blows hot) to the south, and the temperature falls within a few hours, sometimes as much as 30° or 40° .

Melbourne, the capital, with its suburbs up to a radius of 10 miles, has a population of about 400,000. It is situated on the River Yarra, where it flows into Hobson's Bay, at the north of Port Philip Bay, and contains numerous handsome public buildings, churches, banks, theatres, hotels, &c. The principal street, Collins Street, is rather more than a mile in length and 99 feet broad, and some idea of the wealth of the city may be gleaned from the fact that land at the west end of Collins Street, where the principal business houses are situated, has recently sold for about 2,000*l.* per foot of frontage. The city is particularly well laid out, the streets running east and west or north and south, the principal ones being of equal breadth with and about the same length as Collins Street. Its appearance is in parts somewhat marred by the irregularity in size of the houses, but this is being remedied as old leases fall in. A great feature in Melbourne is the number of public parks and gardens, which are most valuable as air spaces, and are jealously guarded from encroachment.

The total trade of Victoria, exports and imports, for the year 1886, was valued at 30,325,896*l.*, the number of vessels cleared inwards and outwards for the same year was 4,631, and their tonnage 3,735,387 tons.

On March 31, 1887, there were eleven principal banks of issue in Victoria, having upwards of 400 branches or agencies; their total assets on that date were 42,179,560*l.*, and liabilities 34,363,026*l.*; a branch of the Royal Mint, opened in 1872, had up to 31st December, 1886, issued coin and bullion to the value of upwards of 32,000,000*l.*

Melbourne is approached by sea through Port Philip Bay, the entrance to which from the Southern Ocean is about 2 miles wide between Points Lonsdale on the west and Nepean on the east; reefs, however, run out from both points and the navigable channel between them is not more than about 1,600 yards wide; this channel is called The Rip, and the tide rushes through it with great velocity. From Point Lonsdale the coast sweeps round in a curve, forming Lonsdale Bay, to Queenscliff, opposite to Nepean and about 2 miles distant from it. After passing between Nepean and Queenscliff two channels are open to ships proceeding to Melbourne; the South Channel on the Nepean side, and the West Channel on the Queenscliff side; the latter is only available for ships not drawing more than 19 feet; the South Channel can be used at high tide by vessels drawing up to 27 feet, the rise and fall of the tide being about 2 feet. The distance to Melbourne from the Heads by the South Channel is 42 miles and by the West 29 miles. There is also between the West and South Channels another channel called Symond's Channel, which however is not buoyed and is rarely if ever used; it has a depth of water at its shallowest part of about 18 feet, and is tortuous and narrow at its northern end. Two small channels, Cole's Channel and the Lœlia Channel, branch off from the West Channel opposite Swan Island; the Lœlia Channel is not buoyed and cannot be used by vessels drawing more than 18 feet; Cole's Channel is partially buoyed and is available only for vessels not drawing more than 14 feet.

To the west of Port Philip Bay and inside it is Corio Bay, on the south-west shore of which is situated the town and port of Geelong; the port can be used by vessels drawing up to 21 feet. Geelong is a town containing 10,000 inhabitants, has a considerable shipping trade, four woollen mills and several other manufactories; it is about 45 miles by rail from Melbourne and 18 miles from Queenscliff, and is the junction station for Ballarat, the Western District, and South Australia.

Besides the towns of Geelong and Queenscliff there are several small watering places on the shores of Port Philip Bay, as Portarlington on the west, and Portsea, Sorrento, Dromana, and Mornington on the south and east. On the east are also the towns of Frankston and Mordialloe, the former 28, the latter about 14 miles from Melbourne.

About 20 miles south-east of Nepean is Cape Schanck, from which the coast line runs in an easterly direction for about 9 miles to West Head and the Village of Flinders, where the submarine cable to Launceston is brought ashore at the western entrance to Western Port Bay; this bay runs up in a northerly direction for about 30 miles, and the land between it and Port Philip Bay is generally known as



the Mornington Peninsula, about 16 miles across at its widest; it is for the most part covered with thick scrub and forest, is very thinly populated, and is very badly off for water. Across the mouth of Western Port Bay is Philip Island, the channel between which and West Head is about $3\frac{1}{2}$ miles wide. On its eastern side Philip Island is separated from Griffith's Point on the mainland by a very narrow channel, which does not however lead into navigable water. North of Philip Island, separated from it by a channel about 4 miles across at its widest, is French Island; between French Island and the mainland there is navigable water on the west and opposite a portion of the north coast of the island. On the remainder of the north and on its eastern side it is separated from the mainland by shoal water and mud flats.

About 25 miles up the bay from West Head, on the eastern coast of the Mornington Peninsula, is the fishing village of Hastings, through which a railway line is in course of construction, from Frankston to Stony Point, about 5 miles to the southward, where, as well as at Crib Point and Sandy Point, to north and south respectively of Stony Point, and about 2 miles distant from it, there are excellent landing-places. At Sandy Point the largest vessels could lay alongside, and at Stony Point and Crib Point within 20 yards of the beach.

The only seaport towns in Victoria of any importance besides Melbourne and Geelong, are—

Warnambool, population, 5,477 ; 170 miles distant from Melbourne.				
Port Fairy	"	2,000 ; 180	"	"
Portland	"	2,000 ; 225	"	"

all in the western district; the latter is connected by rail with Melbourne, and railways are in course of construction to the other two.

In Portland Bay there is good anchorage for any number of the largest vessels, and it is sheltered, except from south-east winds.

Among the principal towns in the interior of Victoria, are—

Ballarat, population, 37,260 ; distant from Melbourne 100 miles by rail.	
Sandhurst, population, 28,662 ; distant from Melbourne 100 miles by rail.	
Castlemaine, population, 6,000 ; distant from Melbourne 77 miles by rail.	
Stawell, population, 4,980 ; distant from Melbourne 176 miles by rail.	
Sale, population, 4,000 ; distant from Melbourne 127 miles by rail.	

The aim of any system of defence must, of course, be to meet the attacks to which the place to be defended is liable. It is desirable, therefore, before considering the defence of Victoria, to inquire into the nature of attack to which it, in common with the other Colonies of Australasia, is liable.

It will probably be generally conceded that while the British Empire holds its present position among the nations of the world, any deliberate attempt to capture and occupy any of its Colonies is very unlikely, and could not, at any rate, be undertaken secretly and suddenly, and that such attacks as the Colonies are liable to would be of the nature of raids, made with the object of striking a blow, levying contributions, inflicting loss and humiliation on the nation, and getting away again as soon as such objects had been effected. Such attacks might be naval; or possibly it might be attempted to put ashore a military force and attack the capital by land. As to the strength of such attacks: prior to 1883 the question had been considered by several distinguished Officers, and the gist of their opinions was to the effect that the Colony was liable to attack by a few fast cruizers, which might have eluded the British squadron, and that a force up to about 2,000 men might possibly be put ashore for a land attack. Since these opinions were given the conditions have, however, considerably changed; but if the attack has derived advantages from improvements in naval construction, giving greater steaming powers and increased capabilities of carrying troops, the defence has also, during the same period, gained an advantage, if it be made use of, in the power of rapidly concentrating troops from the various Colonies, given by the completion of railway communication between Brisbane and Adelaide. No doubt this question has received the attention of the Intelligence Department. I venture to think that it is most desirable that estimates there formed, from time to time, on the best information, of the probable strength of attack, should form the basis on which the various colonial defence schemes are framed and periodically revised.

It was to meet such attacks as the Colony was considered liable to up to 1883 that the present Defence Force of Victoria was called into existence about the commencement of the year 1884; but it has since been considerably strengthened, the estimates, exclusive of military works, having increased from 110,000*l.* to about 135,000*l.* per annum.

The establishment of the military forces at the termination of the last financial year, that is on the 30th June, 1888, is shown in the attached table, the total of all ranks being 5,939; on the 31st August last the actual strength of all ranks was 4,837. In addition to this number there were 1,380 men in the 2nd Class Militia Reserve—a reserve established in 1885, the members of which receive no pay, and have no obligation, except to turn out in the event of national danger, notified by proclamation of the Governor—and the formation of a 1st Class Reserve, the members of which receive an annual retaining fee, contingent on their performing a certain amount of drill during the year, had just been approved of, and a few men had been transferred to it, some from the ranks and others from the 2nd Class Reserve. The object of this reserve was to bring the various militia corps up to war strength, immediately on proclamation being made by the Governor, with men who are ready at once to take their places in the ranks, no man being allowed to join the reserve

until he has been effective in the militia for at least a year. Besides the foregoing there are in the rifle clubs, of which there are 174 in the Colony, 4,266 sworn-in members (exclusive of those in the Mounted Rifles and Rifle Volunteers), most of whom are, at any rate, fair shots, and who would be available, in the event of war, for service with any branch of the force, but who would of course require training before they were fit to join the ranks.

The military forces are practically divided into two portions, having distinct duties, viz., the garrison force and the field force.

The garrison force consists of the whole of the garrison artillery, regular and militia, the permanent section and submarine mining company of the corps of engineers, and a portion of the infantry, and its duties are to garrison the works protecting Port Philip Bay, man the guns, lay and work the mine-fields, and in conjunction with the local navy to defend Melbourne from attacks by sea, also to man the batteries at the outlying ports.

The field force consists of the remainder of the military forces, and is available to resist any attack which might be made upon Melbourne or its defences by land, a scheme of defence having been drawn up in which possible landing-places on the coast and the routes leading from them to Melbourne have been enumerated and described, and dispositions for the troops to meet certain eventualities have been recommended.

The garrison artillery is all told off to stations in the various forts and batteries where the necessary camp equipment for the numbers required at each place is kept in readiness, a proportion of regular artillery being told off to each work in the Port Philip defences, the Officers of the regular artillery acting as Staff Officers in addition to their regimental duty. The submarine miners, in like manner with the garrison artillery, are told off to stations in conjunction with the permanent section of engineers, which during peace time has charge of the submarine mining dépôt, electric lights at the various forts, &c., the mines for each mine-field being kept loaded, and with all the stores pertaining to them ready for immediate laying.

All that has to be done then when the forts have to be manned is to ration them, to send the allotted proportion of regular artillery to each fort, the detachments in peace time being kept small, so as to have as many men as possible at the headquarters of the corps at Queenscliff, to muster the various militia corps (none of which connected with the defence of Port Philip are more than four hours by rail from the Heads), and to despatch them to their destinations.

The whole of the field force and the infantry attached to the garrison force has a complete field equipment. The camp equipage of the country corps is kept in their respective stores, that of metropolitan corps in ordnance charge at Melbourne. The necessary carriage could in case of emergency be obtained by the Assistant-Commissary-General in a few hours; special carts and wagons, such as small-arm carts, artillery, engineer, and ambulance wagons, forges, &c., are kept in ordnance or in corps charge.

The whole force, field and garrison, could be collected in assigned

positions within twenty-four hours of the Governor's proclamation calling it out for service, provided of course that the railways were made fully available. The commissariat and medical arrangements necessary for its maintenance in the field have been provided for.

Every year at Easter these arrangements are tested as far as practicable, the garrison artillery and submarine miners taking up their allotted positions at the Heads, and the remainder of the militia and mounted rifles going into camp for six days.

I am of course debarred from going into detail as to the position of the mine-fields and the arrangements for their protection by the batteries and by the vessels of the Victorian squadron, but I have already mentioned the channels of approach, which are well known to mariners of all nations, and the forts and batteries which dominate them at Queenscliff and Nepean in the South Channel, at Point Franklin, and Swan Island, are visible to anyone sailing round the bay. These works could all be held against assault by their own garrisons, supported by the infantry already referred to as forming part of the garrison forces, at any rate for a sufficient time to enable them to receive assistance from the field forces. They are principally armed with B.L. guns of the latest type, and have an ample supply of ammunition in well-constructed magazines. Watkin's system of position finding is being applied to the service of all the guns, the works are well provided with electric lights, and are all in telegraphic communication with one another.

With regard to the training of the forces, the regular troops are trained precisely on the same lines as are regular troops in England. There are not the same powers of enforcing discipline by means of punishment, but on the other hand the pay is much better, and there is never any necessity to keep a bad character after he has shown himself to be one. In the Victorian Artillery a gunner on joining gets 3*s.* per diem, of which he has to pay 1*s.* for messing; after a year's service he can get 3*d.* per diem good conduct pay, after two years, 6*d.*; after three years, 9*d.*; after completing two years' service he gets 3*d.* per diem deferred pay up to five years, the extent of his original engagement, and thereafter on re-engaging 6*d.* per diem for the remainder of his service; 3*d.* per diem is also allowed with the cross-guns to each 1st class gunner;¹ a gunner in his sixth year of service may therefore draw the very respectable pay of 4*s.* 6*d.* per diem.

In the Militia the training is carried on throughout the whole year, each corps or detachment having its own drill room, or as it is commonly called, orderly room. There are in Melbourne and its suburbs fifteen of these rooms, which have cost on an average about 1,800*l.* each, viz., one for each company of the two metropolitan bat-

¹ There is an annual course of gunnery between 1st August and 1st January, attended by all gunners and non-commissioned officers under the rank of staff sergeant; at its conclusion there is an examination, theoretical and practical, and all obtaining 70 per cent. of full marks are eligible as 1st class gunners—the number was limited to twenty-six—but was about to be increased. Similar courses are held in the Militia Artillery, but the cross-guns do not carry extra pay.

talions of infantry (there are four companies to a battalion), two for the three batteries of field artillery (two of the batteries sharing the same orderly room), one each for the three metropolitan batteries of garrison artillery, and one for each company of the corps of engineers, and a room in the Victoria Barracks is set apart as an orderly room for the ambulance corps. In the country districts there is an orderly room at Ballarat for a whole battalion (the 3rd), at Sandhurst and Castlemaine one at each place for a half battalion of the 4th, and the cavalry at Sandhurst and the remaining garrison batteries have each a separate orderly room. These orderly rooms consist generally of one large room for drilling in, with office, store rooms, Officers', non-commissioned officers', and men's rooms built round it, and generally quarters for a sergeant-major attached, the size varying with the number of batteries or companies using the room. At Ballarat, which is the largest, the drill room is 180 feet long by about 80 feet broad. For the artillery gun sheds, and for field batteries harness rooms also are attached. The field company of engineers, besides their drill room, have a sand modelling room, several model rooms, and store rooms for their field stores and telegraph equipment (they have 40 miles of air line), the whole having been built by the men of the corps, who have also constructed a large number of excellent models. The Submarine Mining Company have a very complete establishment at Port Melbourne, Hobson's Bay, where they have an instructional mine-field and every necessary appliance, with electric light, position finders, &c. The Government, in fact, have not spared money to make the means of instruction, as well as the equipment of the various corps, as complete as possible.

Attached to every orderly room there is at least one warrant or non-commissioned officer of the permanent Staff, every troop, battery, or company (when the company occupies a separate room) having a permanent sergeant-major, while the field artillery brigade has a brigade sergeant-major, and each battalion of infantry a regimental sergeant-major in addition. In the country battalions there are only two permanent sergeant-majors in addition to the regimental sergeant-major, and two companies in each battalion have Militia sergeant-majors.

The duties of battery and company sergeant-majors are to take charge of orderly rooms and all Government stores, make out Returns, keep the books, and act as clerks to their Commanding Officers, drill recruits, and whenever their companies are on parade or in camp to perform the duties of the corresponding rank in the regular Service. The brigade and regimental sergeant-majors perform, under the Adjutants, who are Militia—not regular—Officers, the duties appertaining to like positions in the regular Service. Every Militia Commanding Officer has therefore under his orders a warrant or non-commissioned officer of the permanent Staff, whom he can hold responsible for all routine office work, and for the custody or issue in accordance with regulations of all equipment and Government property in his charge.

There is a school of instruction at Melbourne where Officers and non-commissioned officers of Militia are instructed in their drills and

duties, and receive certificates of qualification. This school is superintended by the senior Staff Officer, assisted by the other Staff Officers, the warrant officers at headquarters acting as instructors in drill, as do also any non-commissioned officers of the permanent Staff who may be detailed from time to time on evenings on which they are not required with their companies.

The orderly rooms are open for drill at least two nights every week, sometimes much oftener when there are many recruits to be drilled. All corps parade for afternoon drills on two Saturdays in each month, drill being carried out in various public parks and military reserves; in some cases there are small parade grounds attached to the orderly rooms.

There is a Staff Officer at headquarters for each branch of the Service, who exercises a general supervision over the instruction of his particular branch, frequently visits the orderly rooms and afternoon drills, and passes all recruits into the ranks.

In addition to the annual encampment at Easter, at least two whole day parades in each year are ordered by the Commandant, who also inspects every corps twice during the year.

Every Officer, non-commissioned officer, and man of the Militia is allowed pay for 6 whole days, 20 half days, and 45 night drills during the year, and in order to be effective must attend 3 whole days, 15 half days, and 24 night drills; a whole day may be counted instead of two half days, and conversely, and a half day may be counted instead of two night drills, but night drills cannot be counted either for pay or effectiveness, instead of daylight drills. A large number of men and most of the Officers put in more than the number of drills for which pay is allowed.

A great feature in the annual training is the competition in all branches of the Militia for various trophies presented by prominent colonists. Among the principal of these are the Clarke trophies for field artillery, garrison artillery, and infantry respectively. In the field artillery the trophy is competed for among the three batteries (all armed with the 12-pr. B.L. gun), each battery firing 30 rounds, during manœuvre, at unknown distances, within a given limit of time. In the garrison artillery three detachments, under an Officer, fire 12 rounds at an unknown range from 80-pr. R.M.L. guns on traversing platforms, at a target representing the side of a ship, in a given time. And in the infantry the battalions each fire 30 rounds per man in form of attack.

These competitions are all keenly contested and worked up for. The Government have placed 1,000*l.* on this year's Estimates to provide money prizes in connection with them.

In connection also with the training, the Victorian Rifle Association is deserving of mention. At its meeting last year upwards of 3,000*l.* was given away in prizes, a large proportion of which was for military matches. It is managed by a Council, of which the Military Commandant is *ex officio* President, and in which the A. A. General and the Officer Commanding the mounted rifles are *ex officio* among the Vice-Presidents. The metropolitan corps carry

out their musketry practice on its ranges at Williamstown; the country corps having their own ranges in the vicinity of their several stations.

The mounted rifles, though enrolled under the same Act, and subject to the same general regulations as the Militia, are in other respects under a different organization. They are a purely Volunteer force, and receive no pay whatever, but an effective allowance of 2*l.* 10*s.* per head is granted annually, as in the Militia, to cover cost of clothing and keeping saddlery in order, and to assist in defraying expenses incidental to camps and parades. They supply their own horses and saddlery, and are supplied by Government with arms and accoutrements, the remainder of their horse appointments, cloaks, haversacks, &c. They are divided into nine companies, each company being formed of a group of detachments, varying in strength from about ten to thirty men, the detachments being scattered all over the Colony, and the headquarters of each company being fixed as nearly as possible in the centre of each group of detachments.

The battalion is commanded by a Lieutenant-Colonel who, as well as his Adjutant, is a permanently employed Officer. Each company is commanded by a Captain, assisted by four Lieutenants, and has a permanently employed sergeant-major, whose duties are similar to those of the permanent Staff of the Militia, and who visits the various detachments of the company in turn; the detachments within reach of one another frequently meeting together for drill. Every mounted rifleman must be a member of a rifle club, at the range belonging to which he carries out his annual course of musketry, in addition to which, in order to be classed as effective, he must attend twelve daylight drills in each year; this, however, is a very small proportion of the work actually done in most detachments. There are no regular orderly rooms for the mounted rifles, but store-rooms are hired at headquarters of each company.

The rifle volunteers recently raised have an organization similar to that of the mounted rifles.

There are a few of the Militia corps which have peculiarities of organization or equipment deserving of special mention.

The Nordenfelt Battery was raised by the exertions of Sir William Clarke, one of the principal landed proprietors in the Colony, and is composed principally of men in his private employment; the horses are his own property, and he pays the salary of the permanent sergeant-major, who, however, receives Militia pay from the Government, as do the Officer and the remainder of the non-commissioned officers and men of the battery.

It is armed with three Nordenfelt ten-barrel rifle calibre guns, drawn by four horses each; the Officer, sergeant-major, numbers one, and trumpeter being mounted, and three numbers per gun carried on the carriages; the whole equipment is supplied by the Government. The battery forms a complete unit; it usually encamps with the cavalry, and works during manœuvres with cavalry or mounted rifles. The men are armed with swords, carried as in R.H.A., and two carbines per subdivision are also carried on the

limbers. Gun-shed, store-rooms, and stables, and a practice-range are provided by Sir W. Clarke.¹

The field artillery is organized in a brigade of three batteries, commanded by a Lieutenant-Colonel of Militia, with a Militia Officer as Adjutant; there is a permanent brigade sergeant-major (a non-commissioned officer of the Royal Artillery), and each battery has a permanent battery sergeant-major. The Officers and brigade and battery sergeant-majors are mounted, the Officers finding their own horses, and receiving, as do all mounted Officers of Militia, 50*l.* per annum forage allowance. The horses for the guns, four for each, are hired from contractors who, as far as possible, always keep the same horses for the work. The horses are usually employed in carting, and are rather heavy for field artillery; they are, however, very powerful, four of them make nothing of drawing a 12-pr., and for short distances they can cover ground at a good pace. The harness, which forms part of the battery equipment, is an adaptation of the French pattern, breast harness being used instead of collars, and the traces attached to swingletrees instead of to loops on the splinter bar, this method of attachment having been found greatly to obviate the liability to galls from the breast pieces.

Each battery is armed with six of the new 12-pr. B.L. guns, fitted with Scott's revolving and telescopic sights, the carriages are Armstrong pattern, with 4 feet 6 inch wheels and friction band brakes. Each subdivision carries its picketing gear complete on the limber in marching order, and leather cases containing assortments of collar-makers' and farriers' tools for field use are carried on the axletrees of two of the subdivisions, complete sets of these and wheelers' tools being carried with the battery baggage. There are two wagons to each battery, and arrangements have been made for carrying a battery reserve of ammunition, the cartridges in S. A. ammunition wagons, and the shell in hired carts with special fittings.

The numbers one are not at present mounted but sit on the limbers, they have, however, recently been instructed in riding in anticipation of horses being provided for them.

Officers, non-commissioned officers, and men are armed as in the Royal Artillery, and two carbines per subdivision are carried on the limbers. Officers and mounted non-commissioned officers use horse appointments of English Staff pattern, which has been adopted for mounted Officers of all arms throughout the Service.

Great pride is taken by the batteries in keeping their harness and equipment in smart and serviceable condition, and in their general turn-out. They have had considerable practice in entraining and detraining, and at a recent encampment the whole brigade was entrained in forty-five minutes.

160 rounds per battery are allowed annually for practice. The batteries parade horsed on twenty Saturday afternoons during the year, in addition to the six days' training at Easter, and to whole day

¹ Might it not be possible to obtain some of the field artillery, so badly wanted for the defence of England, on a system similar to that by which the Nordenfolt battery is obtained in Victoria?—T. D.

parades on the Queen's birthday, Prince of Wales' birthday, and sometimes on other special occasions. Standing gun drill, theory of gunnery, sword, carbine, and marching drills, &c., are taught at night in the orderly rooms, when there is also gun and harness cleaning.

The field artillery is about the most popular corps in the Militia, there are always men under training waiting to be enrolled, and the attendances are always largely in excess of those for which pay is given.

The cavalry are equipped with light cavalry swords in wooden scabbards, with Sam Brown belts, carbines in buckets, and bandoliers. Like the mounted rifles, they find their own horses and saddles, but they receive the same pay as the rest of the Militia.

The whole of the garrison artillery militia are armed like the infantry, engineers, mounted rifles, and rifle volunteers, with the Martini-Henry rifle. The Victorian artillery and dismounted corps of the field force have the valise equipment without valise. The mounted rifles carry water-bags attached to the saddle instead of water-bottles.

Kits of all corps are carried with baggage rolled in a canvas bed-bag, which can be filled with straw when available, and waterproof sheets are provided for issue on special occasions.

In the foregoing remarks I have endeavoured to sketch very briefly the military preparations which have been made for the defence of Victoria, and I would now like to say a word or two as to future requirements of that Colony in conjunction with those of her neighbours.

In alluding to the attacks to which all the Colonies are liable I have referred to the advantage which has been gained by the defence in the power of concentrating troops, given by the recent extension of the railways. This advantage relates, of course, only to the means of resisting a hostile landing; the defence of the various ports from naval attack must necessarily remain purely local, for the forts could not be denuded of their garrisons in order to resist a land attack in another quarter, and it is essential that these garrisons should be intimately acquainted with the working of their own particular defences.

But, while naval attack is, I think, that to which the Colonies are most liable, attacks by troops landed for the purpose of turning the coast defences are undoubtedly possible, and it is, indeed, to meet such attacks that the bulk of the land forces in all the Colonies is kept up. The very fact, however, of troops being available to resist such attacks greatly diminishes their probability, and if arrangements existed to ensure the united action of the forces of the various Colonies in case of invasion, this probability would be still further decreased, and, at the same time, the land forces of the various Colonies might be kept at a less strength than if each Colony unassisted was liable to have to bear the whole brunt of an attack by land.

The railways, as I have said, have given the power of concentrating troops, but certain steps remain to be taken before that power can be made use of. The laws of the various Colonies have no effect outside their own particular limits; consequently, when the troops of one Colony enter another they are no longer under discipline, even though the Discipline Act of their Colony permits their employment beyond its limits, and such permission is not given by the Acts of all the Colonies.

This difficulty might, I suppose, be remedied by reciprocal Colonial legislation; but the simplest remedy would appear to be an Imperial Act, which should of course leave many points to be settled by local regulation, and which could be adopted by any Colony by means of an enabling Act. At the present time the Colonies of Queensland and South Australia have adopted the Imperial Army Act for the government of their regular forces and of all troops when called out for service, and a few additional sections to the Imperial Act, providing, among other things, for Colonial enabling Acts, would probably be found to meet all requirements.

With such legislation in force, it would be easy to draw up a scheme for federal defence. The inspection of the land forces of the various Colonies by a General Officer of the Imperial Service has for some time past been strongly advocated, and while such an inspection would be of great value in itself, and a great encouragement to those entrusted with the command of the troops, it would also afford an opportunity for the preparation of such a scheme by an Officer of rank and experience unconnected with any particular Colony, and whose recommendations would certainly carry great weight with all.

There is, I believe, among the Colonial forces a very strong sentiment of attachment to the British Army. I can at any rate speak with certainty as to its existence in the forces which I have had the honour to command. It is, I venture to think, a sentiment which it is very desirable to encourage, and much might be done in this way by recognizing the Colonial forces as a portion of the Imperial Army in a manner something similar to that in which the status of the Militia of the United Kingdom has of late years been recognized. Such a recognition, together with the legislation I have referred to, and the increased facilities which may be expected to be afforded to young Australians for entering the Army when a Military College, as now proposed in Victoria, has been established, would, I believe, go a long way towards consolidating the defences of the Empire, and towards keeping the great Colonies of Australia in touch and sympathy with the mother country, and would be a practicable and practical step in the direction of Imperial Federation.



Establishment of Victorian Military Forces

	Colonel.	Lieutenant-Colonels.	Majors.	Captains.	Lieutenants.	Adjutants.	Quartermaster.	Brigade-Surgeon.	Surgeons-Major.	Surgeons.	Veterinary Surgeons.	Assist. Commiss.-General.	Deputy Assist. Com.-General.	Permanent.	Militia.	Warrant officers and regimental staff sergeants.	
Permanent.																	
Headquarter Staff.....	1	2	2	..	..	..	..	..	..	..	..	..	..	..	2	..	..
Victorian Artillery.....	1	1	3	..	..	..	..	..	..	..	..	..	2	..	..
Permanent Section Corps of Engineers.....	2	..	..
Permanent Staff of Militia.....	..	1	..	..	..	1	..	..	..	..	..	..	..	11	..	..	..
Mounted Rifles.....	1	..	..	..	..	..	..	..	..	..	..	..
Rifle Volunteers.....	1	..	..	..	..	..	..	..	..	..	..	..
Cadet Corps' Staff	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Total Permanent Forces.....	1	3	4	1	3	3	..	..	..	..	..	..	..	15	..	..	..
Militia.																	
Cavalry.....	1	2	..	..	..	..	..	..	..	..	..	..	..	..
Nordenfolt Battery.....	1	..	..	..	..	..	..	..	..	..	..	..	..
Field Artillery	1	3	3	9	1	..	..	..	..	..	..	..	..	..	..	..
1st Brigade Garrison Artillery	1	4	4	9	..	..	..	..	..	..	..	..	..	..	1	..
2nd "	3	4	7	..	..	..	..	..	..	..	..	..	..	..	..
Corps of { "Submarine" Mining Company	1	3	..	..	..	..	..	..	..	..	..	..	..	..
Engineers { Field Company.....	1	3	..	..	..	..	..	..	..	..	..	..	..	..
1st Battalion Victorian Rifles	1	2	4	12	1	..	..	..	..	..	..	..	..	..	1	..
2nd " " "	1	2	4	12	1	..	..	..	..	..	..	..	..	..	1	..
3rd " " "	1	2	4	12	1	..	..	..	..	..	..	..	..	..	1	..
4th " " "	1	2	4	12	1	..	..	..	..	..	..	..	..	..	1	..
Ambulance Corps (included with Metropolitan Infantry)	(1) ¹	..	..	..	..	..	..	..	..	..
Ordnance, Commissariat, and Transport Corps } (included with Garrison Artillery)	(1) ¹	(1) ¹	..	..	..	..	..
Medical Staff.....	1	6	9	..	..	..	..	..	..	..	..
Mounted Rifles	9	36	..	1	..	..	9	9	..	..	..	..	1	..
Rifle Volunteers
Volunteer Ambulance Corps.....
Grand Total.....	1	9	22	40	121	8	1	1	6	18	9	..	..	15	6	..	..

NOTE.—Establishment of 1st Class Reserve had not been fixed. There is no fixed establishment of unattached Officers, but

Military Forces, 30th June, 1888.

Deputy Assist. Com.-General.	Warrant officers and regimental staff sergeants.		Troop, battery, and company staff sergeants.		Sergeants.	Sergeant farriers.	Sergeant collar makers.	Corporals and bombardiers.	Drivers.	Boys.	Trumpeters and buglers.	Gunners, sappers, and privates.	Electricians.	Total all ranks in time of peace.	1st class reserve.		Remarks.
	Permanent.	Militia.	Permanent.	Militia.											Officers.	N.-C. officers and men.	
..	5	The sergeant-majors of brigades, batteries, battalions, troops, and companies are included among "Permanent Staff of Militia" and "Mounted Rifles," and not with their corps.
..	2	..	2	..	9	..	..	18	..	8	2	162	..	208	..	..
..	2	..	1	..	3	..	..	2	..	..	..	13	..	21	..	..
..	11	..	21	..	..	..	..	..	..	..	..	..	..	32	..	..
..	9	..	..	..	..	..	..	..	..	..	..	11	..	..
..	3	4	Farriers and trumpeters (except cavalry) included among rank and file.
..	2	..	..
..	15	..	36	..	12	..	..	20	..	8	2	175	..	283	..	..
..	1	3	..	..	3	..	..	1	60	..	71	..	..
..	1	2	..	..	4	6	..	..	12	..	26	..	..
..	3	18	..	3	18	57	150	..	266	{ 1 Surgeon-Major included in Medical Staff. 1 staff sergt. with Vict. Art.
..	..	1	..	..	16	..	..	16	..	..	..	391	..	442	..	..
..	14	..	..	14	..	..	..	285	..	327	..	..
..	4	..	..	4	..	..	..	40	10	62	..	..
..	1	4	..	..	4	..	..	..	86	..	99	..	..
..	..	1	16	16	4	444	..	501	1 The figures in parentheses are not included in the total.
..	..	1	..	..	16	..	..	16	..	..	4	444	..	501	..	..
..	..	1	..	2	16	..	..	16	..	..	4	344	..	403	..	..
..	..	1	..	2	16	..	..	16	..	..	4	344	..	403	..	..
..	(1) ¹	..	(3) ¹	..	..	(3) ¹	..	..	..	(32) ¹	..	(40) ¹	..	..
(1) ¹	(1) ¹	(4) ¹	(5) ¹	(11) ¹	..	(23) ¹	1 The figures in parentheses are not included in the total.
..	16	..	..
..	..	1	..	..	36	..	..	36	..	..	..	852	..	989	..	..
..	600	..	..
..	50	..	..
..	15	6	36	10	173	..	3	183	63	8	19	3,627	10	5,039	

ed Officers, but there were 68 on the list on 30th June, 1888, and these would be available with 1st Class Reserve.



MODERN MILITARY RIFLES AND FIRE TACTICS.¹

By Colonel C. G. SLADE, h.p., late Rifle Brigade.

MAGAZINE rifles will play an important part in future wars, and some changes may be expected in fire tactics consequent on their introduction.

The definition of a modern magazine rifle is one that can be discharged more than once, without the firer having to insert a cartridge into the chamber by hand. Strictly speaking, a magazine rifle need not necessarily be a repeater, but, practically, all magazine arms worthy of notice are repeaters. The number of cartridges that can be carried in the magazine is limited by questions of weight and handiness. There is no fixed rule as to the number of rounds: it depends on the ideas of the inventor, the calibre of the arm, and the nature of the system. As a general rule the number varies from four to ten.

It is difficult to say when magazine small-arms were first invented. Some curious old flint and steel musquets, at least 200 years old, carrying one or two spare charges of loose powder and bullet in the butt—illustrations of magazine arms and yet not repeaters—are to be seen in military museums.

It is not until the Civil War in America, 1861-64, when the cavalry on both sides were armed with the Winchester and Spencer repeaters, that we have any account of magazine rifles being used in war. General Sheridan states in his "Personal Memoirs" that "Custer's repeating rifles poured forth such a shower of lead at the battle of Dinwiddie Court House in March, 1863, that nothing could stand against it." In the Russo-Turkish Campaign in 1877, the Turkish cavalry was extensively armed with the Winchester repeater.

In 1878 the French Navy was supplied with the Kropatschek, a somewhat heavy and clumsy rifle, with a calibre of 0.433-inch, the magazine holding seven cartridges, being a tube in the fore-end under the barrel.

In 1884, during the Tonquin Campaign, bodies of infantry, each armed with repeating rifles, first came into contact, the Chinese troops being well supplied with the American Lee, having a detachable magazine, and on more than one occasion they held their own against the native auxiliary troops in the French service, and inflicted severe losses on them.

At the taking of Tunis in 1885, and against the Hovas in Madagascar in 1885-86, magazine rifles were used by the French, and in 1887 the Italian expedition to Abyssinia was provided with them.

It may be taken for granted that not only will the single-loader soon be as obsolete a weapon for military purposes as the muzzle-loader, but that all rifles of large calibre are doomed.

¹ See also JAMES, vol. *xxi*, p. 135, *et seq.*—ED.

Every nation in Europe, without exception, has either adopted a small-bore magazine rifle or is taking steps to procure one, but up to the present no nation has been able to arm the whole of its forces with modern rifles. The French are the most advanced in this respect.

Austria, Germany, and Italy are making great efforts in the same direction, and it is to be hoped that now this country has settled on a pattern rifle, its issue to the Regular and Auxiliary Forces will be pushed on as rapidly as possible.

A short statement of the present state of the question of magazine arms at home and abroad may fitly precede any consideration of the nature of the fire tactics which their adoption will probably render necessary.

Austria.—In 1886-87 the Austrians adopted the Mannlicher magazine rifle, and some 80,000 were manufactured and issued to two Army Corps. The calibre of this arm, like most foreign rifles of the past, was 0·433 inch, and the magazine, holding five cartridges, was a fixture under the action just in front of the trigger-guard. It is understood that a small-bore Mannlicher, 0·314 inch, has now been adopted; and that when all the factories are in full swing the output will be at least 1,000 rifles a day.

The method of loading the magazine in this rifle is peculiar and very ingenious. The whole of the ammunition carried by the soldier is made up in packets of five cartridges, held together at the base in a thin metal holder; this holder, with the five cartridges, is inserted bodily into the magazine, and when the last cartridge is fired the holder drops out through a slot in the bottom of the magazine on to the ground. The Austrians have boldly faced the introduction of the magazine system and always load through the magazine; in fact it is laid down in their regulations, "that although the rifle can be used as a single-loader, yet it is against the principle of the arm." This system of loading is well worthy of consideration, and presents many advantages; it is possible that a modification of this system may yet be adopted in our own new rifle.

Belgium.—Trials with magazine rifles of various calibres and different systems have been carried out in Belgium since 1885. It is stated in "*La Belgique Militaire*" that, whilst no definite conclusion has yet been arrived at, the most favourable results have been obtained from the 0·314-inch Mannlicher and the Nagant, whilst the Pieper, the Schulhoff, the Mauser, the Pieper-Mannlicher, and the Caspar-Engh, are still under trial. The magazine of the Nagant rifle has lately been altered, and the cartridges are now filled in from above, as in our own rifle.

Canada.—Canada, like the remainder of our great Colonies, has been waiting for the mother country before coming to a decision as to the adoption of a small-bore magazine rifle.

China.—The Chinese have not yet definitely adopted a small-bore magazine rifle, but they have a good store of the American Lee 0·433-inch, with a detachable magazine.

Denmark.—Trials have been going on in Denmark with various systems of magazine rifles since 1881, and it is believed that it has

been definitely decided to adopt a magazine rifle with a calibre of 0.315 inch.

France.—The French until quite recently had two different descriptions of magazine rifles in use, viz., the Kropatschek and the Gras; these have now been superseded by the Lebel.

Great secrecy has been observed about this new rifle and its ammunition, but after all it is only an old friend under a new name, and the Lebel rifle is neither more nor less than the Kropatschek, with the calibre reduced from 0.433 inch to 0.315 inch, and the recoil taken on two lugs instead of on one side only.

The magazine is a tube in the fore-end under the barrel, holding eight cartridges; a long spiral spring is compressed at the muzzle end by each cartridge in succession pushing the one in front of it up the tube.

There is a "cut off," so that the rifle can be used as a single-loader at will.

The weight of this rifle is 9 lbs. 3 ozs. empty, and with eight cartridges in the magazine 9 lbs. 11 ozs.

The French journals speak in the highest terms of this arm and its performances, but there are some obvious objections to it. It is not easy to charge the magazine quickly, and it is complicated, and would be difficult to repair on service if it got out of order. The arrangement of the cartridges one behind the other is faulty, as the balance of the arm must alter with every shot fired.

It is believed that a sufficient number of the Lebel rifles have been manufactured to supply the whole of the active army.

Germany.—Germany was the first of the Great Powers to adopt a magazine arm, and some years ago converted her service rifle, the Mauser, into a magazine arm, the cartridges being arranged in a similar manner to the French Kropatschek.

It has now been decided to use a small-bore rifle, probably 0.298 inch, but no issue to the army on a large scale has yet been made. It is probable that the magazine on the new arm will be under the action in front of the trigger-guard, thus abandoning the old tube system which the French have deliberately adhered to.

Italy.—Some twelve months since the Italians changed from the Vetterli magazine rifle, having ten cartridges under the barrel in a tube, to the Vitali, having a magazine above the action holding four cartridges only; these are packed somewhat after the manner of the Austrian Mannlicher. The calibre of this rifle is 0.408 inch. It may be anticipated that Italy will follow the example of France, Germany, and England, and eventually adopt a small-bore magazine rifle.

Norway and Sweden.—In 1886 the Committee which had been appointed to consider the whole question of magazine rifles reported in favour of the Jarmann rifle, having a calibre of 0.399 inch, and a certain number were made and issued for trial. Since then, trials have been instituted with various systems of magazine rifles of smaller calibre.

Portugal.—It is believed that the Portuguese have given up the rifle first adopted, viz., the Guêdes, and have now decided on a small-

bore magazine rifle on another system, but no issue has yet been made.

Russia.—Up to quite recently no active steps had been taken in Russia to procure a magazine rifle, and military opinion was against any reduction of calibre. Trials are now, however, progressing, and it is probable that Russia will eventually follow the lead of other Powers, and arm her troops with a small-bore repeating rifle.

Spain.—A Committee had been sitting for some time in Spain to examine various systems of magazine rifles, but nothing has been made public as to the decision arrived at.

Switzerland.—Just as in 1863 the adoption by Switzerland of the 0.409-inch was a step in advance of other nations, so it is again Switzerland which has led the way to a further reduction of calibre.

As far back as 1879 Major Rubin had made private trials with small-bore rifles (0.354-inch, 0.335-inch, and 0.315-inch), and arrived at the conclusion that the latter gave the best results, but that it was absolutely necessary to make an entire new departure as regards the ammunition, and it is this which has so long delayed the universal introduction of small-bore military rifles.

The Swiss have for many years used the Vetterli magazine rifle, 0.409-inch (see above). They have now decided to adopt the small calibre, but will, it is believed, retain the Vetterli system.

Turkey.—In the early part of 1887 the Turkish Government entered into a contract for the purchase of 300,000 German Mauser magazine rifles of the old pattern, 0.433-inch. It is to be hoped that they will soon obtain a rifle with a smaller calibre, and of an improved pattern.

England.—The question of introducing a magazine rifle into our Service has been under consideration since 1877, but it was not taken up with much vigour, and before any decision was arrived at, it was resolved to change the calibre of the Service arm from 0.450 inch to 0.402 inch.

In 1885 the new arm, called the Enfield-Martini, was tried by troops, and in some respects it proved superior to the Martini-Henry.

In August, 1885, it was decided to adopt a magazine rifle having a calibre of 0.402 inch. This decision rendered necessary a change of breech action, as it was considered mechanically impossible, or nearly so, to convert the falling Martini block to a magazine attachment. Within the last twelve months two ingenious inventions for converting the Martini-Henry into a magazine rifle have been brought forward, but owing to the size of the cartridge any magazine or hopper at the side of the action must necessarily be very clumsy. Major Harston, of the Canadian Militia, certainly succeeded in overcoming the difficulty of the falling block, but it is very doubtful whether the gain of conversion would be worth the cost.

As a bolt action has been in use for the last twenty years on the Continent, it was decided to give up the Martini breech action in future manufacture, and to adopt some form of bolt action.

A very large number of magazine rifles of various kinds, principally German, Austrian, and American, were brought before the Com-

mittee appointed to examine into the question, but, with the exception of three, all either broke down under trial, or for various reasons were considered unsuitable for the Service. The three rifles which passed successfully through the tests of endurance and exposure were the Owen Jones, the Lee, and the Lee fitted with the Bethel-Burton magazine.

In 1886 trials with the three above-mentioned rifles were continued, and some slight alterations were made in each arm at Enfield.

The American Lee, which had passed successfully through all the tests, was put on one side, as the military authorities pronounced against the principle of a detachable magazine pure and simple.

In the autumn of 1886 the Owen Jones and the Lee-Burton were tried by the Royal Navy, and the former was condemned, as the mechanism was somewhat complicated and costly, and it would have been a difficult arm to repair, especially on service. As an instance of the difficulties attendant on the selection of a magazine rifle, it may be stated that 2,000 rounds were fired through the magazine of the Owen Jones in one afternoon, without a single hitch or mishap, and yet it subsequently failed more than once to feed up the cartridges when under trial.

The Lee system, in which the magazine is underneath the action just in front of the trigger-guard, was again taken into consideration, and it was found possible to fix the magazine by a screw, and also to charge it when on the rifle, thus removing the two objections which had previously caused it to be put on one side. The rifle was then called the "Improved Lee."

The Owen Jones having been withdrawn, there remained for final trial only two rifles, the Improved Lee and the Lee-Burton, the former having the magazine under the action in front of the trigger-guard, the latter having an overhanging magazine on the right side of the action. As the breech action, a strong and simple bolt, was the same in both rifles, it became a question of the position of the magazine only which had to be decided.

In May 1887, 300 specimens of each arm were sent out to the Army and the Royal Navy for trial at home and in India. When the reports were received, it was found that the general verdict was strongly in favour of the Improved Lee, and the Lee-Burton was consequently thrown out.

Whilst the above-mentioned trials were being carried out, the question of a smaller bore than 0.402 came prominently to the front, but owing to the fact that some 80,000 of the new 0.402-inch Enfield-Martini barrels had already been manufactured, and that many distinguished Officers were strongly opposed to any further reduction of bore, those who advocated the immediate introduction of a small-bore met with considerable opposition.

Those who opposed the small-bore said: "The small bullet is not sufficient to stop cavalry charging; it will go right through man or horse with but little shock, leaving an almost imperceptible wound, and cavalry will assuredly ride over infantry. Accuracy at long ranges will be out of the question, as the small bullet will be blown

about by the wind; the striking energy at long ranges will be trifling; the fouling in such a small barrel will be excessive; the question of the ammunition to be used will be difficult to solve; and finally, that as no nation in Europe had as yet adopted a small-bore, it was at all events premature to think of adopting one in this country."

Those who advocated the small bore replied: "The Martini-Henry bullet failed to stop by shock the Soudanese Arabs, or Zulus, many of whom charged right up to our squares when struck in a non-vital place. The small bullet from its high velocity will probably inflict as severe a shock as the 0.402-inch, and to stop a horse by shock alone would require a bullet as large as one's fist. There will be increased accuracy and penetration at all ranges, and the accuracy will be kept up to distances hitherto undreamt of. The reduction in the size and weight of the cartridge will enable the soldier to carry more ammunition without increasing the weight on his person. The trajectory of the bullet will be lower, and the fire zone increased. The saving in transport of ammunition will be very great. A greater number of cartridges can be carried in the magazine without increasing its size. That it having been decided to adopt a magazine rifle with a bolt action, the change from 0.45 to 0.402 inch was halting half way, and the gain would simply consist in the addition of the magazine, as the range, penetration, accuracy, and weight of ammunition would remain practically the same; and finally, that a small-bore magazine rifle was one of the forward steps in military science which was inevitable. It is obvious that there must be a limit to the reduction of bore, otherwise the bullet might be brought down to the dimensions of a knitting needle. The bullet must be of a sufficient size and weight to kill or disable up to 2,000 yards, retain its accuracy up to at least 1,600 yards, and have fair penetration at that distance."

In the spring of 1887 trials were authorized with the Swiss Rubin rifle, a single-loader having a calibre of 0.295 inch, for the purpose of testing these opposite opinions, and as the trials progressed it became more and more evident that the small bore was in all respects superior for military purposes to the 0.402-inch or any other rifle of large calibre.

The exhaustive trials to test the smashing power of the small bullet on carcasses, and its penetration into steel plates, wood, rammed earth, and other substances, convinced the Inspector-General of Cavalry, and all the Officers of the Medical and Veterinary Departments who assisted at the trials, that cavalry would fare no better against the small-bore bullet than against the 0.402 inch.

At long and extreme ranges, no matter what the weather was, the small-bore more than held its own against the Enfield-Martini, and there was singularly little fouling.

The Committee being satisfied that the principle of a small-bore was correct, proceeded to carry out various experiments with a view of ascertaining the exact calibre, nature of rifling, form of rifling, and system of magazine most suitable for adoption into the Service.

The Rubin rifle, with which the trials had so far been conducted, was not in many respects quite suitable for a military weapon, and it

was determined to build up an arm which should combine the best points of various systems, with such improvements and alterations as further trials and experience might suggest.

It was found as regards calibre that 0.303 inch gave the best results, and that the Metford system of rifling was superior to the ratchet or any other that was known to the Committee.

As the Lee bolt had been under observation for three years, and had passed successfully through the most severe tests, it was decided to adopt it with certain modifications and improvements suggested by the Assistant Manager at Enfield.

As regards the magazine, it was decided to adopt the Lee system as regards position, and to arrange the cartridges chequer-wise similar to the method adopted in the Krnka magazine. As there were objections both to a fixed and a detachable magazine, a compromise was effected by securing the magazine on the rifle from loss by a few links of steel chain, and by providing one spare interchangeable magazine to be carried on the soldier's equipment when on service.

In September, 1887, six magazine rifles, with short sword bayonets, containing all the above recommendations, were made at Enfield, and in December some preliminary trials were carried out at Aldershot and Hythe with most satisfactory results. In January, 1888, a pattern magazine rifle and side-arm were submitted to the authorities, and recommended for trial on a more extended scale by the Army and the Royal Navy; and 350 rifles and 50 carbines were manufactured at Enfield.

These arms were sent out in July, 1888, to India, Egypt, and Nova Scotia, and were also tried at a number of stations in Great Britain and Ireland.

The reports received as to the accuracy, non-liability to injury on service, and general suitability of the rifle as a military weapon, were highly satisfactory, and, finally, in December the pattern arm was formally approved and adopted as the future Service rifle.

The following is a description of the Enfield magazine rifle:—

Calibre, 0.303 inch.

No. of grooves, 7.

Rifling, "Metford," 1 turn in 10 inches.

Weight of rifle, with magazine (empty), oil bottle and jag (in the butt), 9 lbs. 4 ozs.

Magazine, detachable, holding 8 cartridges.

Side-arm.

Length of blade, 12 inches.

Weight of arm, 1 lb.

Ammunition.

The precise nature of the ammunition to be used in modern military small-bore rifles has long been a stumbling-block, and has doubtless retarded the introduction of this class of weapon. All the preliminary trials by the Committee, and by the Army and Navy,

were made with Swiss Rubin cartridges, manufactured at Thun in Switzerland.

Explosive, 70 grains of compressed black powder.

Bullet, copper cased, weight 217 grains.

Weight of cartridge, 1 oz. Weight of 115 rounds the same as that of 70 Martini-Henry cartridges.

Muzzle velocity, about 1,800 foot seconds.

Pressure, 18 tons (about).

The question of small-bore ammunition for military rifles presents great difficulties, and it is by no means certain that the explosive can be looked upon as definitively settled.

The compressed black powder pellets are apt to vary in velocity, and when a higher speed than 1,850 feet is attained, the pressure mounts up to an inconvenient, not to say dangerous, extent.

The French are using a chemical compound which undoubtedly gives a very high muzzle velocity (upwards of 2,200 f.s.) ; it is smokeless, and gives out a faint report.

The Germans are said to have adopted the Duttchenhofer semi-smokeless powder, with a speed of about 2,000 f.s.

It is not known what pressure is set up in the chamber by the French powder, nor what are its storage and keeping qualities in all climates. The Duttchenhofer does not give any excessive pressure as tested by the pressure gauge ; but like the French its keeping and storage qualities are unknown.

Chemical powder presents certain advantages, viz., absence or diminution of smoke, faint report, little or no fouling, and regular shooting, combined with great accuracy.

On the other hand, these advantages would be overbalanced if it were found that chemical powders were unstable in hot or damp climates, and liable under certain varying conditions of climate and temperature to set up abnormal and dangerous pressures, thereby straining the breech action and rendering extraction difficult. It is said that a new compound has lately been invented, giving a muzzle velocity of 2,400 f.s. with but little pressure. At short ranges, say, up to 500 yards, the increase of fire zone gained by a velocity of 2,000 f.s. over one of 1,880 f.s. is practically *nil*, and on the whole the question is still an open one.

In all military rifles of small calibre the bullet is a compound one, having a lead core and an envelope or covering of some hard metal. It was found during the trials carried out in Switzerland by Professor Huebler and Major Rubin that a pure lead bullet was unsuitable, as the barrel became leaded after a few rounds, especially in hot or dry weather. Copper, nickel, and steel have all in turn been tried as a covering for the bullet. Copper is apt to fly off, and the first shot out of a clean and dry barrel is erratic. Steel is liable to rust, and it would seem that ferro-nickel is the best covering that has yet been brought forward.

The Lorenz Company have a method of soldering the nickel on to the lead core, and this gives satisfactory results, as the core and the covering do not separate on impact.

As regards the shape of the bullet, the Metford match bullet gives the best results, both for accuracy, length of flight, and penetration.

It is probable that the ammunition of the future will be made up with a nickel-coated bullet driven by a charge of smokeless and almost noiseless chemical powder.

At the present moment the rifle for future supply may be considered as settled in every point; but the precise nature of the ammunition that will be issued with it has not yet been finally determined.

It would take too long to describe or even name the sixty or seventy magazine rifles and the large number of devices for quick loading which have been brought to the notice of the military authorities in this country. Previous to 1887 nearly all the rifles were of large calibre, but recently all the military rifles that have been submitted have been small-bores. Many possessed great merits, but failed in one or two points to come up to the standard qualifications necessary in a military magazine rifle, which, as regards their importance, may be set down in the following order:—

1. Strength to stand the rough usage and exposure incidental to service in the field.
2. Easy extraction of cartridge-case after firing.
3. Convenient weight and general handiness.
4. Flatness of trajectory.
5. Accuracy.
6. Simplicity and certainty of magazine system.
7. Ease of manufacture and repair.

There appears to be little divergence of opinion with regard to the main features of modern military rifles; all have a bolt action, and the calibre varies in different countries from 0.298 inch to 0.315 inch. This slight difference in the calibre has no effect, practically speaking, one way or the other. It is when we come to the type or system of magazine that there is found to be a want of unanimity.

In considering the question of the magazine, the following are the main points:—

- (a.) Whether the magazine should be an integral part of the rifle;
or,
- (b.) A semi-fixtured, detachable at will by the soldier; or,
- (c.) Carried on the person, and attached only when required.

Most of the Continental Powers have adopted a rifle the magazine of which is an integral part of the arm.

We in this country, on the other hand, have preferred type *b*, which really also embraces type *c*, as our rifle can be used as a single-loader with or without the magazine, and the one spare magazine now carried by the soldier could, if necessary, be supplemented by the addition of three or four extra magazines.

It is quite an open question which of these three systems is the

best, and a decision can only be arrived at by weighing the advantages and disadvantages of each one against the other.

The magazine is, after all, only a minor factor in the question; the change of most importance in modern military rifles is that of calibre, with possibly the addition of smokeless powder. Perfection and finality are not to be expected in military weapons, but in these days of gigantic armies or armed nations, a change of armament means an expenditure of some millions; and, as France and Germany have already incurred enormous expense by changing, first to a magazine rifle of large calibre, and now to a small one, it is more than probable that the present description of small-arm will hold its own in Europe for some years to come.

It may be that the next change will be in the direction of utilizing the recoil, so that the rifle will load and fire itself, and only require to be pointed at some object by the soldier.

A great outcry has been raised in some quarters on account of the delay that has taken place in providing our Army with a magazine rifle; but looking to what has taken place abroad, we may, as taxpayers, congratulate ourselves that our new rifle has not been adopted hastily. It is absolutely certain that had the original intention of the authorities to introduce the 0.402 Enfield-Martini in place of the Martini-Henry been carried out, it would have resulted in a great waste of money, for with the universal introduction of the small-bore on the Continent, we must have followed suit, as England cannot afford to lag behind her neighbours in matters of armament. As it is, we have made one change only, and that a successful one, for it is confidently believed that our new rifle possesses all the qualifications necessary in a military weapon in a greater degree than any other military rifle which has yet been produced in any country in the world, and is a thoroughly sound and serviceable soldier's weapon.

PART II.

We have no experience to guide us as to the effect of small-bore magazine rifles in war; but all the experiments that have been carried out in this and other countries have incontestably proved their superiority in all the essential qualifications of a military weapon over rifles of large calibre.

Their introduction is one of the steps in advance made by military science.

Strategy, in its main features, must remain unaltered by any change of armament; it is otherwise with tactics, as the nature of the arm in use must affect the nature of the tactics employed. Successive changes in arms have brought about corresponding changes in tactics, and it is only reasonable to suppose that the introduction of small-bore magazine rifles will necessitate further changes.

To enter into the whole question of tactics as likely to be affected by the new arm would open out too wide a field of discussion, but we may well consider the tactical employment of the magazine rifle;

the most suitable and effective way of developing its power; and what changes in fire tactics may be expected.

The main points of difference between the modern military rifle and its predecessor are—

1. The addition of a magazine.
2. Increased effective range.
3. Smokeless or semi-smokeless powder.

First. As concerns the magazine—

- a. Its gain over a single-loader.
- b. Its use in war.

Owing to the time necessary to refill the magazine after its contents have been expended, which varies considerably according to the nature of the magazine, it is very doubtful whether, if the fire be continued for one minute, a magazine rifle has any superiority as regards rapidity of fire over the single-loader. It is stated that with the cartridges placed in the most favourable position for loading, upwards of fifty rounds have been fired in one minute from the Soper single-loader. No magazine rifle that has yet been invented has ever exceeded that rate of fire, nor would it be of any advantage.

The gain of a magazine rifle, whether it be of large or small calibre, over a single-loader, apart from the confidence that it inspires, consists solely in the number of rounds that can be fired rapidly through the magazine. The soldier has not, at perhaps a critical moment, to fumble about, after each shot, to get out a cartridge from his pouch.

The question of the use of the magazine is one of some importance. Is the soldier to load and fire at all times through the magazine, or is he to use his rifle as a single-loader, reserving his magazine for critical moments and close quarters? Are we to train our men to use the magazine, which will always be on the rifle, at their own discretion, or forbid them to do so without orders? The majority of Officers of experience are of opinion that the soldier should use his rifle as an ordinary single-loader, except when ordered to fire through the magazine; but a great deal depends on the qualities of the soldier, his fire discipline, the amount of ammunition that he carries, and the nature and method of its supply in the field.

It has frequently been urged as an objection to the magazine rifle, that the soldier would expend his ammunition too quickly. When the breech-loader was first introduced the same argument was used, but the statistics of the expenditure of ammunition in modern campaigns tend to prove that although in some instances battalions and companies have fired away a large amount of ammunition, yet on the whole the expenditure has not been much in excess of what it was in the days of the muzzle-loader.

In "Infantry Fire Tactics," by Major Mayne, R.E., it is stated, "that at the Battle of Königgratz in 1866 the 1st Prussian Army expended on an average only twelve rounds per man, although on

the other hand three battalions averaged thirty rounds per man and some few companies as many as eighty."

During the Franco-German War, 1870-71, at the Battle of Gravelotte, the French troops defending St. Privat fired away all their ammunition (ninety rounds), and the ammunition wagons not having come up, they were forced to retire.

During the Russo-Turkish Campaign in 1877 the Turks sometimes fired away as many as 100 rounds per man.

Expenditure of ammunition is to a great extent a question of fire discipline; and as the lightness of the new cartridge will enable the soldier to carry a greater number of rounds, the introduction of the magazine should not be dreaded on the grounds of undue expenditure of ammunition.

Secondly. The increased effective range.

It has been said that extreme range fire is only waste of ammunition, and has never yet really checked the advance of an attacking force.

In the new "Infantry Drill" it is laid down "that rifle fire between 1,700 and 800 yards may be classed as unaimed;" but in another portion of the book it is stated "that fire may be opened on battalion or company columns and on compact bodies of artillery or cavalry up to 1,700 yards." This limit of the employment of rifle fire is based on the power of the Martini-Henry rifle, but as it is not sighted up to 1,700 yards it is not apparent why that particular distance should have been selected.

The effective fire of modern rifles at extreme ranges will be found to be much greater than is generally supposed, and when our men have got accustomed to the new rifle and understand the use of the extreme range aperture back-sight and dial fore-sight some marvelous results may be expected at distances hitherto undreamt of.

There are many instances on record of unaimed long-range fire proving very destructive. At Gravelotte and Mars-la-Tour the attack of the Prussian Guard on St. Privat was checked by the galling long-range fire of the French, and it is stated in Captain F. Stone's work, "Tactical Studies from the Franco-German War, 1870-71," "that the masses in rear of the skirmish-line of the Germans were driven to deploy to the left of the line of attack instead of maintaining their proper position in support of the line of skirmishers." During the Russo-Turkish Campaign in 1877, heavy losses were inflicted on the Russian reserves by the unaimed long-range fire of the Turks. May we not suppose then that aimed fire when employed by picked men will prove still more destructive at extreme ranges, more especially in the preparatory stage of the attack and defence?

Colonel Lonsdale Hale, in a lecture he delivered at Aldershot, stated "that he was much impressed with some long-range firing he had seen in the Long Valley, when at 2,000 yards at a target 40 yards by 8 the hits were 5 per cent." This was most probably with the experimental 0.402-inch Enfield-Martini, which never got further than the trial stage. What this abortive attempt on the part of

Enfield to get beyond the Martini-Henry cost the country, will probably never be known.

The new magazine rifle is sighted up to 3,000 yards; and the following experiments that were carried out at Aldershot on 21st September, 1888, foreshadow in the future aimed and effective fire at distances very much in excess of that mentioned by Colonel Hale.

The firing squads were composed of detachments of nine men from the 1st Devon, 1st Suffolk, and 1st Sussex Regiments, and 1st Battalion King's Royal Rifles.

The target represented a battalion of eight companies of thirty-five files standing in quarter column.

The day was dull with a medium wind blowing from the right rear.

The conditions were unfavourable to good practice for the following reasons:—

The men were not picked shots, and had never before fired at distances over 800 yards.

The rifle with the new extreme range sight was somewhat strange to them.

The sand was blowing about, the target was only visible by means of a powerful glass, and aim had to be taken on a natural object well away to the flank of the target.

The results were as follows:—

Distance.	No. of hits.	Percentage of hits to misses.
2,000 yards	181	48
2,400 „	109	29
2,800 „	104	18

The whole of the firing was by volleys, firing as one squad; and had it not been for the good fire discipline displayed by the men and the excellent manner in which the executive words of command were given by Major Mecham, the D.A.A.G. for Musketry, the practice would not have been so good.

Are not the results given above sufficiently satisfactory to make us pause before we condemn extreme range fire as a waste of ammunition? Great care in training Officers and men will be required in order to obtain full value from the powerful weapon about to be issued to our Army, and the greater the intelligence displayed by the men, the better will be the results. We must, in fact, educate our men up to the new arm.

We may conclude that in consequence of the increased effective range, aimed fire at extreme ranges will be made use of in future to a far greater extent than has hitherto been the rule, and that horse and field artillery must be prepared to come under effective infantry fire at greater distances than they have hitherto calculated on.

The fire of field artillery may be said to be effective against formed bodies—as a regiment of cavalry, a battery of artillery, or a battalion in quarter column—up to 4,000 yards, or even 5,000 yards on favour-

able ground; but not on infantry dispersed in skirmishing line beyond 1,800 or 2,000 yards, if so far.

A well-trained company of infantry firing rapid magazine volleys at 2,000 yards would probably put 500 bullets into a battery whilst it was unlimbering and coming into action—say, in thirty seconds; one of the exceptional cases when the magazine should be used at extreme ranges.

At some experiments carried out at Okehampton in 1888 the following results were obtained:—

Distance.	Object.	Rounds fired.	Hits.
2,800 yards. . . .	50 men kneeling in a shelter-trench	12 shrapnel 8 shells	} 11 Every man struck. One gun disabled.
1,200 „	4-gun battery in the open	24 shrapnel 12 shells	

Now the field-gun is probably as accurate at 2,800 as at 1,200 yards, the difference in the results being due to the difference in the marks fired at. Had the infantry been lying down in the open without a shelter-trench to mark their position, it is more than likely that as many as eleven hits would not have been obtained.

Thirdly. The effect of smokeless or semi-smokeless powder.

It is probable that before long the use of smokeless or nearly smokeless powder in military rifles will be universal. The French have already adopted it. The Germans have taken the Duttonhofer semi-smokeless powder, and it is believed that the Austrians and Italians are about to follow suit. The explosive for our new rifle is not definitely settled, but trials in the same direction are being carried out.

As regards the tactical aspect of the question there is a good deal to be said on both sides.

It is true that smoke may obstruct the aim and offer no mark for the enemy's fire; but on the other hand, troops advancing to the assault of a position are sometimes enabled to move forward shielded from view by the smoke of the firing line, and in the chapter headed "Infantry Fire" in the new "Infantry Drill, 1889," it is laid down "that the smoke created by independent fire will be in many instances a good screen for the line coming up in rear of the first line to deliver their final charge."

Lord Wolseley, in reviewing Colonel Maurice's article on "War" in the "Encyclopædia Britannica," says with reference to the battles of the future, "we shall have practically no smoke to mark the position of the enemy's batteries and troops in action," and goes on to remark "that sentries can no longer alarm the main body by the discharge of their rifles." He does not, however, touch on the question of the change in fire tactics which the absence of smoke may render neces-

sary, nor whether the advantage would incline to the attack or the defence.

The statistics of losses in recent campaigns in Europe when breech-loaders were used on both sides point to the conclusion that the introduction of long-ranging magazine rifles, especially if supplemented by smokeless powder, will confer greater advantages on troops defending a position than on those who attack it.

Troops of good quality well posted under cover, and having an unlimited supply of ammunition, will not in future be turned out of a position by a purely frontal attack, unless greatly outnumbered or badly shaken by artillery fire.

If the ground in front of a position be open it is difficult to imagine how an assault could be pressed home in the face of the fire of smokeless magazine rifles in the hands of well-trained and well-disciplined troops.

To reserve the fire when defending a position would be to give up all the advantages conferred on the defence by the introduction of the modern rifle.

The fire tactics of the defence should be to keep the attackers under fire as long as possible; but to render the fire effective, fire discipline and steadiness on the part of the men are essential, and the careful training of company and section leaders and of all junior non-commissioned officers in the various descriptions of infantry fire, and the due application of its principles, is daily becoming of greater importance.

Every man in the front line of the defence should be supplied with at least 300 rounds of ammunition. The correct distance of all prominent objects in the line of the enemy's advance and on the flanks up to 3,000 yards should be ascertained by the range-finder or from the map, and communicated to company commanders and section leaders. The nature of the fire employed should be section volleys.

Fire may be opened at, say, from 3,000 to 2,500 yards should opportunities offer, and be concentrated at first on the formed bodies of the reserves. Exceptional cases might arise when rapid magazine volleys could be employed with advantage even at extreme ranges, but as a general rule magazine fire should be reserved for close quarters or until the attacking force arrived within 300 yards of the position.

It is at this final stage that detachable magazines will prove of great value to the defence. Every soldier in the front line should be provided with five or six spare magazines ready charged, and these he could attach to his rifle one after the other as quickly and easily as a single cartridge can be inserted into the chamber of his rifle.

One of the special features in our new magazine rifle is this reserve of power, enabling a rapid and continuous fire to be poured on the attacking force at a critical moment.

If the assumption that the power of the defence has increased by the introduction of the modern rifle be correct, it may well be asked how is the attack to be carried out, and what change in fire tactics is probable?

It is a very difficult problem to solve, this question of the best way

of advancing to the attack in the face of modern rifles with smokeless powder.

Will the possession of a magazine rifle confer any advantage on the attacking force? Certainly not to badly-trained, ill-disciplined, and indifferently-commanded troops. On the contrary, it would probably prove a curse instead of a blessing, as tending to lead to uncontrolled magazine fire and consequent undue expenditure of ammunition.

Fire tactics must depend greatly on the varying circumstances of the moment, the nature of the arm in use, the quality of the troops, the strength and tactics of the enemy, and the description of weapon with which he is armed.

There is no broad line of demarcation between tactics and fire tactics as between strategy and tactics, they are intermingled and react one upon the other.

The decisive shock of battle nowadays is fire, and everything must be subordinated to it.

The Germans, who are thoroughly practical soldiers, and have the experience of the great war of 1870-71 to guide them, do not admit or lay down any normal order of attack. They say "that in war circumstances, always varying, play the most important part, and that the letter kills the spirit; the proper work of an Officer is brought out by a feeling of responsibility, and all his faculties are stimulated thereby."

As regards magazine fire the Germans forbid its uncontrolled use, and prescribe it under the following circumstances:—

1. When attacking, immediately before the assault.
2. Against cavalry.
3. In case of coming unexpectedly on a body of the enemy.
4. At extreme distances on an object exposed to view for a short time only, as troops crossing a bridge or a number of batteries unlimbering.

Respecting the nature of fire to be employed during the advance, they prefer independent to volley firing, training their young soldiers during the peace manœuvres and exercises to keep cool, to use their own judgment to a great extent, to husband their ammunition, and, above all, to "cease fire" on hearing the whistle, and wait for orders.

There is a great deal of common sense in this. A young soldier, trained always to wait for the command "fire," would be flurried and disturbed at not hearing it through his section or group leader being disabled; at every successive halt he would be uncertain whether to fire or not, and as at close quarters volley firing is impossible, they consider it preferable to train their men accordingly.

In Colonel Maurice's admirable and exhaustive article "War" in the "Encyclopædia Britannica," he states "that it is a matter of great doubt whether in war it is practically possible under most circumstances to deliver a volley at all;" and he bases this remark on the utterances of Captain May, the author of the "Tactical Retrospect," and of Von der Goltz. The former asserted "that no volleys had been delivered in the campaign of 1866," the latter "that it will

not even be possible to fire by groups." Colonel Maurice also points out "that during the war of 1870, cases of volley firing were not very numerous."

The French, who are somewhat addicted to precise rules and regulations for every possible contingency, lay down complicated instructions for the "attack," which would probably go by the board in the hurly-burly of combat.

As regards fire tactics, their regulations for the use of the magazine agree with the German instructions.

They disapprove of volleys except at close quarters.

A new description of fire called "attack fire," which is independent fire on the move with fixed swords, has been introduced into their regulations for the final stage of the attack.

The Austrians, who invariably load and fire through the magazine, prescribe volleys against cavalry and as a rule against artillery also. At distances over 500 yards they make more use of marksmen than is customary nowadays with other nations.

Both in France and Germany it is laid down that the troops to carry out the actual assault are to be distinct from those who prepare it, and in the French regulations it is forbidden to take cover or lie down within 600 yards of the enemy's position.

In our new "Infantry Drill, 1889," it is laid down "that firing will be by section volleys from 800 yards up to 150 yards from the position." Independent fire will then commence, the command being given "Fixed sights;" the second line will then pass through the first and charge; the third line coming up will fire volleys on the retreating enemy.

There is no mention made of magazine fire, nor of any change in tactics or fire tactics which the introduction of the new rifle may necessitate.

What we have to consider are the fire tactics of the new rifle, with its increased effective range and smokeless powder.

Every European army must face the problem how to get over the bullet-sown ground from, say, 2,500 yards from the enemy's position with the least possible loss.

The actual distance of fire-beaten zone to be got over must depend on the nature of the ground and amount of cover. In some cases troops could be pushed up in compact formation to within a moderate range, thus reducing their losses, and increasing the chances of success.

The factors which dominate the nature of the tactics and fire tactics to be employed in the advance are intensity of fire, simplicity of form of attack, and speed.

In consequence of the increased effective range of modern arms, troops will have to form for attack on ordinary ground, at a much greater distance from the enemy's position than has heretofore been deemed necessary; this will render the task of traversing the danger-zone still more difficult, and make it more than ever advisable to have a rapid advance. For this purpose, the soldier must be relieved of as much weight off his back as possible, and the form of attack must be simple.

The main principles of the attack would appear to be the same in all European armies, but the form differs. It is recognized that the force destined to carry out the actual assault must be a distinct body from that which prepares the way.

Tactics and fire tactics have been modified within the last few years, and the changes have been brought about by the experience gained in the Franco-German and Russo-Turkish campaigns.

Is it not possible that the universal use of modern rifles and machine-guns may render necessary some further modifications? Any changes in fire tactics will assuredly be in the direction of intensity and rapidity of fire, and the valuable qualities of fire discipline and steadiness will become more than ever necessary.

We must revert to a cloud of skirmishers advancing rapidly in one general line, and covering by their fire the assaulting troops, who would advance in line with intervals between files.

The same careful training which made Craufurd's brigade and the rifle battalions in the Peninsula unsurpassed as bold and active skirmishers would soon produce battalions equal to the task of covering an attack, using their own judgment when to fire, and pushing rapidly over the ground, far quicker than the present method of section volleys and advances by alternate fractions.

The definite objective points having been determined and communicated to all concerned, special troops supplied with unlimited ammunition and accompanied by all the available machine-guns, would take up favourable positions for covering the whole advance by a heavy and well-sustained fire, and if the nature of the ground permitted might even fire over the heads of the skirmishers and second line.

Such are probably the infantry fire tactics of the future. As regards cavalry, the possession of a magazine carbine will prove of great advantage; its introduction may bring about some change in their arms and equipment and method of fighting. Cavalry are essentially an arm of offence, and we may see cavalry divided into two distinct categories with different functions. Heavy cavalry, armed with lance and revolver only, to charge the enemy's horsemen, and light cavalry, armed with carbine, to act dismounted, and pushed rapidly forward to outflank and enfilade by fire a body of infantry or batteries engaged. The magazine carbine would also prove most valuable to small bodies of cavalry sent on to hold a bridge or defile. There have been many occasions of late years when the possession of magazine rifles would have been useful to our troops, generally outnumbered. Isandhlana and Rorke's Drift, both on 22nd of January, 1879, are notable examples. The disasters of Laing's Neck and Ingogo, in South Africa, in January and February, 1881, would not, presumably from the conditions under which these engagements were fought, have been averted; but would the Boers have carried Majuba Hill on 27th February, 1881, in the face of the fire from magazine rifles?

At the battle of Abu-klea, in the Soudan, on 17th January, 1885, and when the Arabs attacked the zareba at Tofrik on March 22nd of

the same year, and again a day or two afterwards when the British square was attacked, the magazine rifle would have proved most valuable.

Previous careful training is, however, necessary to ensure coolness and good shooting under excitement.

It has been the fashion in some quarters to decry the shooting of the British soldier in battle; but any shortcoming in this respect must be put down to the system under which he is trained, rather than to the man.

The average Englishman or Scotchman has in him, by his physique, temperament, characteristics, and inherited good eye-sight, all the necessary qualifications to be a fair rifle shot during the excitement and turmoil of an engagement.

We have, hitherto, in our musketry training, laid far too much stress on individual shooting at known distances at a fixed mark; in fact, the practical training of the Army in battle-fire has been strangled by the red tape of Hythe.

The differences between range and field practices are as marked as between barrack square drill and field manœuvres, and bear the same relation to one another, both are merely means to an end, viz., the efficiency of the soldier on service.

With the introduction of the new rifle we may look for more practical training in fire tactics. The general handiness of the magazine rifle and the absence of perceptible recoil will assuredly improve the shooting of the Army generally. As the powers of the new arm are best developed on the defence, it is most fitting that it should be entrusted to the Volunteers with the least possible delay, and no question of expense should stand in the way of its issue to all the forces of the Crown, Auxiliary as well as Regular. If every battalion of Volunteers in the United Kingdom were supplied with this rifle, and one or two Maxim machine-guns, the question of the defence of the country would assume a different aspect to what it does at present.

The Volunteers are the Standing Army of England, but what is the condition of the Force at the present moment? Is it really fit to take the field at short notice, and has its training hitherto been of the practical nature which modern warfare demands? The bulk of the Volunteers are lamentably deficient in equipment, and have had little or no training in practical fire-tactics. With all Europe armed to the teeth, the time has arrived when the efficiency of the Volunteers should be gauged by a different standard than what has hitherto been customary. Target practice in the ordinary sense of the term is all very well for teaching a recruit the use and power of his rifle, and it is a source of amusement and sometimes of profit; but it is no training for the field, and the sooner this is recognized by the authorities and the Volunteers themselves, the better it will be for the country.

NAMES OF MEMBERS who joined the Institution between the 1st July and the 31st December, 1888.

LIFE MEMBERS.

Fisher, J. F., Lieut. R.A.
Clifton-Brown, H., Lieut. 2nd Bde. Lon.
Div. R.A.
Corbet, A. D., Major R.M.L.I.
Wathen, E. O., Lieut. Leins. Regt.
de Jersey, C., Capt. R.A.
Ricketts, W., Lieut. R.N.

Gooch, T. S., Lieut. R.N.
Moorhead, R. B., Lieut., late 12th Foot.
Mansfield, Hon. H. W., Lieut. 20th Hus.
Fielding, G. P. T., Lieut. Colds. Gds.
Shipley, M. L., Lieut. Ben. S.C.
Heneage, Algernon W., Mids. R.N.
Ellison, G. F., Lieut. N. Lan. Regt.

ANNUAL SUBSCRIBERS.

Lee, A. H., Lieut. R.A.
Young, H. A., Lieut. R.A.
Brett, H. G., Lieut. R.A.
Elliot, H. M., Lieut. R.A.
Jeffreys, W. J. L., Lieut. Essex Regt.
Wright, A. J. A., Capt. E. Lan. Regt.
Nugent, C. H. H., Lieut. R.E.
Vincent, R. D., Capt. Roy. Dub. Fus.
Smith-Neill, J. W., Lieut. Sco. Gds.
Tyndale-Biscoe, J. D. T., Lt. 11th Hus.
Tisdall, A. L., Capt. R.A.
Oldfield, J. R. H., Capt. R.M.L.I.
MacFarlan, H. H., Lieut. Scot. Rifles.
Burton, C. F., Lieut. Roy. Fus.
Wollen, W. B., Lieut. 20th Middx. R.V.
Tippinge, L. F. G., Lieut. R.N.
Campbell-Johnston, S. C. G., Sub-Lieut.
R.N.R.
Doyle, A. H., Capt. Shrop. L.I.
Oldknow, Reginald C., Fleet Eng. R.N.
(ret'd.)
Mitford, B. R., Lieut. E. Kent Regt.
Lester, C. M., Capt. W. Yorks Regt.
Hercy, J. E., Lieut. Sco. Gds.
Pollock-Gore, W. A. M., Lieut. Loth.
Regt.
McAllum, W., Lieut. 17th Middx. R.V.
Churchill, F. V. S., Lieut. (h.p.), late
Roy. Sco. Fus.
Price, E. A. U., Capt. 3rd Batt. Oxf. L.I.
Porter, G. M., Capt. R.E.
Foote, F. O. B., Major R.A.
Corballis, J. F. J., Lieut. 1st Batt. Roy.
I. Regt.
Bower, H. M., Lieut. 1st V.B. W. York
Regt.
Oliver, J. R., Major-Gen., late R.A.

Murdoch, J., Lt.-Col. Q's. R.V. Bde.,
Loth. Regt.
Du Boulay, N. W. H., Capt. R.A.
Baldock, T. S., Capt. R.A.
Sinclair, H. M., Capt. R.E.
Hegan, E., Major 5th Drag. Gds.
McCracken, F. W. N., Major Roy. Berks
Regt.
Brock-Hollinshead, L., Capt. Roy. W.
Kent Regt.
Smith-Dorrien, H. L., Capt. Derbys. Regt.
Watts, C. N., Capt. Derbys. Regt.
Halpin, A. F., Lieut. late Lon. I. Rifles.
Read, A. C., Paym. Gen. Office.
Wright, A. H., Sub-Lieut. R.N.A.V.
Sergison, C. W., Lieut. Sco. Gds.
Fielding, Hon. W. H. A., Maj.-Gen. late
Colds. Gds.
Legge, N., Capt. 20th Hus.
Weston, T. B., Maj. 20th Hus.
Horne, H. S., Capt. R.A.
Carew, P. M. L., Lieut. 20th Hus.
Kennedy, E. C. W. M., Lieut. Mad.
S.C.
Twyford, L. T. C., Lieut. 2nd Batt. N.
Staff. Regt.
Jeffcock, J. W. G. P., Lieut. 19th Hus.
Lee, H. L., Capt. Roy. Berks Regt.
Welstead, H. M., Lieut. Leic. Regt.
Annesley, W. M., Comr. R.N.
Haddan, F. W., Lt.-Col., 4th V.B. Roy.
W. Sur. Regt.
Parker, P. R. H., Capt. R.N.
Baker, G. D., Capt. R.A.
Everett, H. J., Lieut. Som. L.I.
Barry, A. P., Lieut. 4th Batt. Middx.
Regt.

OCCASIONAL PAPERS.

This portion of the Number is reserved for Articles, either Original or Compiled, on Professional Subjects connected with Foreign Naval and Military matters; also for Notices of Professional Books, either Foreign or English.

It is requested that communications or books for review may be addressed to Colonel Lonsdale Hale, at the Royal United Service Institution, Whitehall Yard, London, S.W.

COAST DEFENCE SYSTEMS.

(From Foreign Sources.)

GERMANY.

In examining the arrangements for Coast Defence adopted by the various maritime nations the first place is, incontestably, due to Germany, for in that State the defence of the coasts forms part of one vast, sound, and well-considered whole, and is the subject of accurate studies and of carefully calculated arrangements. This is the case, moreover, notwithstanding the short period which has elapsed since Germany has acquired national unity, and has had leisure to devote any attention to the sea. There, in order that unity of purpose and perfect uniformity of action may be maintained in the general defence of the State and in the mobilization of its forces, even that portion of the defence which appertains to the maritime frontier has been an object of study as regards its general features by the Chief of the Head Quarters Staff, and is under his direct control.

The fundamental idea, military as well as economic, in the arrangement of the naval forces has been from the first, and still is, to make sure before all else that the coast and that the rallying points and bases of operation of the Fleet shall be safe from hostile attack. Then, when this is attained, attention can be directed step by step, so as to extend the radius of naval action until eventually such a point is reached that offensive action, and the protection of an energetic colonial policy, become both more possible and more capable of making themselves feared. Whilst other nations have been embarrassed by doubts and contradictions, Germany, by keeping these aims resolutely in view, has, with marked economy of time and money, made very considerable advances—indeed we have no hesitation in saying that, if she continues to progress as she has hitherto done, the actual Queen of the Seas, England herself, will have much cause for serious reflection.

In apportioning the relative duties of the Army and the Navy in respect to the defence of the State, it has been held as an unquestionable axiom that not only should the Navy be entrusted with the entire defence of the ports where

its budding forces are collected, but that it should also be charged with the entire defence of the littoral, more especially of the submarine and locomotive exterior defences.

In view, however, of the scarcity of means possessed by its youthful Navy, especially in regard to numbers, a scarcity which it is impossible to rectify at once, or indeed for some time to come—it has been found necessary to leave a portion of this task to the Army. Hence—whilst the Navy is relied upon to effectually guarantee the local defences of the two naval ports, the submarine defences, fixed and movable, and the watching of the semaphores along the whole coast—the Army still retains the task of furnishing garrisons for the other fortresses along the coast, and of helping to watch the coast with cordons of reserve troops, in addition to the natural duties pertaining to it of looking after the mobile inboard defence.

Here seems a fit place for us to quote from a Report laid before the German Reichstag in March, 1884, by the Minister of Marine, on the actual state and proposed increase of the Imperial Navy.

Task of Defending the Coasts.

“His Majesty the Emperor has decided to introduce a change in regard to the defence of the coasts; *i.e.*, the Navy is in future to be charged not only with the defence of the two war ports belonging to the State, but also with the naval defence of the sea fortresses and other fortified localities on the coast which belong to Prussia. After closely examining into the exigencies of a future coast war, the best course to pursue, both for the Army and for the Navy, seemed to be to settle upon a regular organic participation by the Navy in the maritime defence of all the coast fortifications. Hitherto the object has been by the aid of troops to close the entrance to the ports as quickly and as securely as possible with torpedoes. Now, this task, which differs greatly from the other class of duties entrusted to sappers, had the defect that in case of mobilization, it withdrew no inconsiderable number of these men from their proper destination: whilst, on the other hand, it was the cause of no slight concern to the Navy, which naturally has a great interest in keeping open, as long as possible, ports which, in case of need, would serve as places of shelter, and which therefore must desire that the obstacles to the ports shall be disposed in such a manner as to delay the entry and exit of its own ships as little as possible. The interests of both parties will therefore be reconciled by the extended use of torpedo-boats, and of batteries of locomotive torpedoes. The introduction of the fish torpedo as a weapon for the Army would have, in a high degree, all the inconveniences which already attach to it in making use of fixed mines. Moreover, no Commandant of a maritime stronghold can do without the assistance of a seafaring *personnel*, who are well qualified to recognize an enemy's ships, and to keep watch on their movements. In order to afford proper aid to torpedo-boats, to take advantage of their successes, and to keep the enemy away—in short, to carry out efficiently the duties of advance guards at sea—the defence must be furnished with vessels of some kind, and these vessels, even if they should have to be requisitioned from the Mercantile Marine, cannot do without a crew who have received proper training; consequently the equipment of coast strongholds must comprehend a naval force, both in *personnel* and in *matériel*.

“When the Army and the Navy act in this manner, by affording mutual assistance to each other, the defence of our coasts will gain in security, the Army will be free from a charge which embarrasses it, and the interests of the Navy will be enabled to make themselves felt on all points of the coast, better than has hitherto been the case.”

We need not pause to point with how much care the defence of the littoral has been secured, by means of the network of railway lines, and by the points of concentration skilfully located so as to form a strong and continuous chain from Pillau to Wilhelmshaven, nor to mention which of the fixed strongholds on the coast are assigned to the Army; we will merely, therefore, content ourselves with directing attention to the system followed in so far as it concerns the Navy. In the two war ports, the Vice-Admiral Commanding the Naval Station is Commandant of the whole local defence. If the *personnel* of the Navy at his disposal is not sufficient, the necessary quota of troops from the Army is placed under his orders. Moreover, as an important element in the defence, especially at these two ports, he has under his jurisdiction all persons employed in pilotage, and in the lighthouses and beacons near the naval port.

Here, as elsewhere, the local maritime defence may be divided into two parts: movable defence and fixed defence.

Movable Defence.

Touching movable defence the following extract from one of the last Estimates is worth quoting:—

"The larger the number of ships employed on political service may be, the less can be reckoned on for efficient co-operation with the floating means of defence that can be disposed of in the direct protection of the littoral, and also the more difficult and slow becomes the mobilization of the ships destined for local movable defence. For the more these vessels are kept waiting for the arrival of complements furnished from the reserve, the less chance they have of being supplied with crews already conversant with the ships in which they will have to serve. Hence what is gained on the one hand by increasing the more distant action of the fleet is lost on the other in the want of promptness with which the movable coast defence can be organized. It is incumbent, therefore, that we should seek to keep the defence in some other direction. Maritime strongholds are in the same condition as frontier fortresses, and require garrisons sufficient for first defence, and must also have their *matériel* ready to enter promptly into action."¹ To attain this end a Naval Reserve Division has been formed in the military ports. This Division is composed of a few ironclads, one of which, acting as a "nucleus," has its complete complement, whilst the others are in a tolerable state of readiness for sea. When mobilization takes place, or during the customary autumn manœuvres, the ship¹ company belonging to the "nucleus" ship is distributed over the others, whose complements are then filled up from the garrison, or from the first individuals of the Reserve who may put in an appearance. By this means the ships which are indispensable to the defence are promptly furnished with complements—a portion of whom at any rate are already familiar with their vessels.

Among the vessels assigned to the normal local defence are torpedo-boats, small gunboats, ironclads, and small despatch vessels and cruisers for watching the coast seaward. The number of torpedo-boats is to be raised to a total of 150. All these vessels are kept ready to take the sea, except a portion which

¹ Indeed, it may be said that no frontier force need require to be ready for war so promptly as the military ports, since not one of them is exposed to such sudden attack directly war has broken out. To be convinced of this it is only necessary to reflect upon the fact that the French squadron of evolution assembled at Toulon could in less than twenty-four hours appear before Spezzia; whilst an Austrian squadron stationed at Pola could appear before Venice in less than twelve hours.—
COMPILER.

are kept in commission all the year round for exercising purposes ; and every year, during the grand autumn manœuvres, a portion of them are mobilized to make sure of their practical and efficient preparation.

Fixed Defence.

It is of considerable consequence that the manning of the coast artillery, and especially the laying down of obstacles and lines of torpedoes, as well as the service of the fish torpedo batteries, should be entrusted to a permanent *personnel*, who are not subjected to the disturbance which interferes with the efficiency of the shore crews when called upon suddenly to man the ships, and who are so familiar with the management of the *matériel* as to be able to make use of it with the greatest promptness. To this end a corps of Marine Artillery has been raised, recruited from long-shore men, who, however, cannot properly be classed as sailors. This corps is commanded and drilled by Naval and Dockyard Officers. At present it has 12 companies and is to be increased. In the event of war this corps is reinforced by men and Officers from the Reserve who are specially noted for the purpose.

In the preparation for and the execution of local defence the following land forces, exclusive of the naval element which may be disembarked, can be made use of :—

- (a.) Naval Staff, which consists of a sedentary class of Naval Officers who, on account of their special technical abilities, are employed on shore, and who obtain separate promotion without requiring sea service.
- (b.) Artillery employés of the dockyard.
- (c.) Torpedo employés of the dockyard.

The duties of these two bodies are self-evident ; their Officers are recruited from among the best gunnery and torpedo under-Officers, and can rise up to the rank of Naval Lieutenant.

- (d.) Corps of Marine Infantry, belonging to the land levy and which is destined to reinforce the garrisons of the maritime strongholds ; the Officers are detached temporarily and by turns from the Army (2 Battalions).

In case of mobilization, all this permanent *personnel* is reinforced by a contingent from the First and Second Naval Reserve specially noted for these various corps. The cadres of these reserves are formed by discharged Officers and under-Officers on leave, and volunteers, who have qualified as Officers in one or other of the corps.

The drilling of the permanent *personnel* assigned to coast defence, the condition of the *matériel*, the organic dispositions for war—all these are studied and regulated for down to the minutest details, so that they may attain their object with the maximum precision and rapidity. Further, in order to make doubly sure of the fact that everything is in a proper state of readiness ; and in order to bring to light defects which, overlooked at first sight, frequently make themselves felt in actual execution, there is carried out every year, at the period of the grand autumn manœuvres, a fictitious total or partial defence, when the whole *personnel* and *matériel* are placed on a war footing.

It may be of interest to reproduce here the instructions issued by the German Admiralty as to exercising the personnel in the war ports.

Admiralty Instructions on the Garrisoning Exercises of War Ports in respect of Coast Defence.

1. In order to familiarize the naval *personnel* with the service of coast fortifications during war-time and when besieged, and in order to make sure

that everything shall be in a constant state of preparedness for war, and further, in order to subject to practical experiment the systems of armament in detail, annual exercises are to be carried out in the war ports of Kiel and Wilhelmshaven by sections of Marine Artillerymen and by the Marine Infantry Battalion.

These exercises are to include (1) General Exercise; (2) Supplementary instruction at the Marine Artillery Gunnery School; (3) a certain number of supplementary exercises of a character in consonance with the main object. These are to take place after the Admiralty has decided upon their date and duration.

Every possible attention is to be paid to the other practical exercises which have to be learnt by the *personnel*, and on no account are the new instructions referred to to interfere with the instructions of the recruits.

In carrying out these exercises, it is to be distinctly understood that they are not to be viewed in the light of sham fights, but that their object is to familiarize the *personnel* who take part in them more thoroughly with the various features and problems which crop up in the defence of the military ports; and by the frequent combined exercises to arouse and foster in the minds of the Marine Artillery and of the Marine Infantry the sentiment of mutual co-operation which the two arms should evince in actual warfare.

Any written communications and designs which may be required in carrying on these exercises, in so far as they may refer to the defensive capacity of the works, are to be treated as confidential.

The Commander-in-Chief of the naval station, after consultation with the Commanding Officer of Artillery and Engineers, will give out the problem to be carried out in the principal exercise, and will nominate a commander who will be entrusted with its execution.

2. The principal exercise will have as its fundamental idea the manning and equipping of the military port, or of one of its sections, in such a manner that the whole of the sections, or part of them, can be occupied. This exercise is to take place either before or after the marine artillerymen undergo firing practice, so as to restrict the expense as much as possible.

The exercises should be directed principally to the choice of such precautions as would have to be taken against attack by a Naval force in the event of an unlooked-for declaration of war. The necessary *matériel* is to be drawn from the Officers in charge of artillery stores.

The following general points should be kept in view in carrying them out :—

- (a.) In every exercise, whatever the extension may be, consequent on the distribution of the *personnel* and the extent of front occupied, the manning and defence of the works should be subservient to a principle of unity, and but one object should serve as basis for the employment of the various arms.
- (b.) The guns which occupy the works engaged, as well as the places from which the reserve of ammunition is drawn, should be supplied with men just as they would be in case of war.
- (c.) The internal telegraphic communications of the works should be made use of within all possible limits, and care should be taken not to omit the exercises in connection with the installation of lights and signals.
- (d.) Technical Officers should, either before or after the exercise, assemble the Officers so as to impress upon them the principles of the gunnery and engineering details carried out.

Instructions must also be given in mounting and dismounting the guns, in seeing to the proper transport of ammunition, in signalling and in measuring the distances on the lines of fire.

These should be followed by such details of labour as would occur in arming the works, constructing cable stages (!), exploding mines, &c.

The marine infantry battalion should be exercised in the necessary precautions for defence ; in the setting of guards, advanced sentries, &c. ; in laying down cable stages (?) and flying bridges ; in getting the obstructions for closing the harbours into position—being aided, if opportunity offers, in some of these details by sappers from the engineers. The battalion should also receive technical instruction in gunnery.

3. The secondary exercises are to be held partly in the spring and partly in the autumn before the men are dismissed on furlough. The younger Officers and the old company under-Officers should follow a course of lectures on fortification, on the features of the surrounding *locale*, on the field of fire of the guns, and on the establishment of points of concentration, &c., and they should do their best to impart like instruction to their men.

Instruction of the Men in the Works.

The lectures should be restricted to individual duties, and should avoid dealing with officially reserved subjects which are intended only for the cognizance of Commanding Officers.

In order to give due prominence to, and to render the *personnel* familiar with, all the necessary precautions to be taken, and to be able to man the works sufficiently in case of sudden attack with the appliances which can be disposed of compatibly with the organization in time of peace, the Commander-in-Chief of the station should work out a plan for the defence on a peace footing. The *personnel* is to be distributed, exercised, and instructed, in consonance with this plan, and the manning of the works is to be repeatedly effected on the signal of "To arms!" These exercises are to be followed by critical conferences of the Officers who have taken part in them.

4. The expenses entailed by these exercises are to be restricted as much as possible, and special care is to be taken to avoid damage to cultivated tracts.

An annual sum of 200 marks¹ for this purpose will be voted for Kiel, and a sum of 300 marks for Port William, including the fortifications of the line of the Jade. These sums are to be taken under cap. 31, art. 22, which will be somewhat increased for the purpose.

5. On the 1st March, every year, the Commander-in-Chief will send to the Admiralty a programme of the exercises to be carried out during the year, making use of the preceding details as a general guide.

On the 1st April, in each year, a *résumé* is to be sent to the Admiralty of the individual exercises carried out in the past year in so far as they concern warlike operations connected with the fortress ; this *résumé* should be accompanied by plans, and any opinions in regard thereto. These reports will then be referred back to the Commanders-in-Chief of the stations, where they are to be kept properly filed on special files established for the purpose.

Concurrently with the report, a memorandum is to be prepared of the various questions and problems which suggest themselves.

General Submarine Defence.

In all the other localities of the coast whose defence is still in the hands of the Army, where there is a fixed and locomotive submarine defence, the Navy is to detach a certain proportion of its *personnel* which is to be placed under

¹ A mark = a shilling.

the orders of the local Commandant. But, as has already been observed, the tendency is towards entrusting as far as possible the submarine defence gradually to the Navy; in fact, as may be seen by consulting the last Estimates, the Navy has already been entrusted with all the *matériel* for the fixed submarine defence of one of the most important points, *i.e.*, the mouths of the Weser.

Coast Surveillance.

The duty of looking after the semaphores along the littoral is performed by the Navy, and excellent service was performed in this respect during the war of 1870. It is exclusively carried out by men who have received a military¹ training and already numbers forty semaphore stations (which, however, only enter into full activity in war-time) and nineteen signal stations. The fixed material of these stations is already in position, and is under the custody of the nearest lighthouse keepers; the movable material is kept ready in chests to be forwarded to the locality on mobilization. A Naval Officer is charged with the duty of visiting the stations every year to make sure that everything is kept in good order. Moreover, everything is so arranged that the *personnel* of the lighthouses, of the fog-signal stations, and of the other coast services, may assist in the work of *surveillance* in war time.

The Navy has also carrier-pigeon stations for communicating with the mainland from the islands near the coasts and from the vessels employed *en vedette*.

The recruiting and the calling out of the Reserves, both for sea service and for land service, are under the charge of the War Administration of the Army, which forwards to the Navy the *personnel* appertaining to the Naval Levy.

The Naval Reserves comprise :—

A First Reserve, or Seewehr, which includes only such men as have served actively. This Reserve has a special cadre for the various categories, and corresponds with the Landwehr of the Army.

A Second Reserve, or Seewehr, which corresponds with the Auxiliary Reserve (Ersatz-Reserve) of the Army.

FRANCE.

In France for a very long period special attention has been given to the arrangements for coast defence; the *personnel* of which, under various names, from the time of Henry III up to that of the First Republic, was in the hands of the Naval Administration. The Republic, along with so many other things, destroyed even this traditional institution; but it was reorganized by Napoleon, and, in accordance with his Decree of 4th August, 1810, the command of the whole coast defence was entrusted to a Naval Officer, the Navy also being charged with the defence of the naval ports of Brest and Rochefort.

The Restoration again made away with the arrangements given effect to by Napoleon, and was inclined to return to those formerly in force, but the coast defence remained in the hands of the War Administration, with the exception of the armament of certain coast batteries established for the protection of the more important naval ports.

In recent times, however, several men of weight having roused attention to

¹ Military in this sense is rather intended to mean "discipline," and equally applies to sailors as well as soldiers. In this instance the men have probably received a *naval* training.

the importance of extending to the Navy a larger share in coast defence, the question has been opened to discussion and seems in a fair way to meet with the solution asked for. Under present arrangements, the Navy is charged with the direction of the defence of the maritime fortresses of the five naval ports, with the task of looking after the armament of the coast batteries, and with the submarine defence of these places; it is also entrusted with the charge of the semaphores along the whole coast. The local defence of the commercial ports and of the other works scattered along the coast remains in the hands of the Army, which also has to furnish the men required for the land fronts of the naval ports.

Naval Ports.

The regulations for the defence of the naval ports have formed the subject of recent consideration, especially in regard to submarine defence and to the *personnel* required for the purpose. The Vice-Admiral, the Maritime Prefect (Commander-in-Chief of the Department), is Military Governor of the Naval Stronghold (the head-quarters of the department), and is in chief command of the defence during war-time. He is aided by a Council of Defence formed of the heads of the land and sea services. During peace-time, however, the troops belonging to the Army are independent of him, being under the control of the War Department and of the Territorial Commander.

A Rear-Admiral, with the title of Major-General of Marine, serves under the orders of the Maritime Prefect, whose duty it is to look after the local defence, all the military services of the Navy on shore, and after the semaphore *surveillance* of the coast belonging to the Department.

The manning of the artillery in the works on the coast is entrusted to the Corps of Marine Artillery. This corps, which is only for land service, is also charged with the manufacture and preservation of all the material of the artillery of the Navy; it has a certain number of battery guardians and artillery guardians attached to it.

The Navy also disposes of the following *personnel* in every naval port for military service on land and for garrisoning the dockyards and works along the coast, viz. :—

Four regiments of Marine Infantry.

One company of Marine Gendarmerie (more especially entrusted with police duty).

Corps of Marine Veterans, including a section of artificers to look after the engines of the boats for local service.

Company of Veteran (or trained) Torpedo Men for the fixed submarine defence.

Corps of Torpedo Artificers to manage and repair the fish torpedoes, the machinery of torpedo-boats, electric apparatus, &c.

The manning of the batteries and the military service on shore may also be supplemented by marine gunners and fusiliers when the requirements of the fleet allow of their disposal.

There is also a certain number of Naval Officers of fixed residence who take part in the technical and military duties on shore.

Submarine Defence.

The submarine defence of the naval ports has recently undergone complete reorganization, and is worthy of special attention. This service is under the management of a special branch of the Ministry, styled "General Direction of Torpedoes," at whose head is placed an Admiralty Official. The Officers of

this branch inspect generally the submarine defence of the ports at certain periods fixed upon by the Minister of Marine.

In each of the three principal naval ports there is formed a Direction of Submarine Defence entrusted to a Captain (Naval) which is directly dependent on the Maritime Prefect. The Director is embarked on board the central ship on movable defence, and his time counts the same as if he were in command at sea. He directs the whole of the local submarine defence, fixed and movable, is a member of the Council of Administration of the Department, and is further charged with the fitting and systematizing on board ships of torpedo *matériel*, with the repair, maintenance, and regulation of such *matériel*, and with the maintenance of the 1st and 2nd class torpedo-boats. The Director is assisted by a local committee for studying questions in connection with torpedoes, by a committee for experiments, and by a committee for regulating the fish torpedoes.

In the less important naval ports, Lorient and Rochefort, the *personnel* for the submarine defence is under the orders of the Senior Naval Officer (Rear-Admiral).

The submarine defence includes the fixed defence and the movable defence, together with the offices and store-rooms required for the purpose.

Fixed Defence.

The fixed defence consists of obstacles, or booms, fixed mines, photo-electric stations, steam launches fitted with spar torpedoes, fish torpedoes, and photo-electric lanterns.

The fixed defence is commanded by a Captain (Frigate), assisted by two Naval Lieutenants, one for the *matériel* and the other for the *personnel*, and by a few other residential Lieutenants, whose services may eventually be placed at the disposal of the fixed defence. He has at his disposal a Chief Torpedo Adjutant and a company of trained torpedo-men, in addition to the other men belonging to the Corps of Marine Veterans, and others, who may be placed under his orders in the event of the fixed staff being insufficient to carry out the extra duties imposed upon them.

The company of veteran (or trained) torpedo-men is charged with looking after and keeping in order the photo-electric apparatus, the electric generators, the telegraphs and telephones, and the watch stations; the company also looks after and charges the fixed mines. Its *personnel* is recruited exclusively from torpedo sailors and torpedo artificers of every grade belonging to the ship's company, or to the Corps of Marine Veterans. In case of war, the men can be embarked on the torpedo-boats supplied for the local defence. Each veteran torpedo-man is armed with a revolver.

A general scheme for combat and a scheme for preparation are always kept ready, according to which the *personnel* is to be periodically exercised.

Movable Defence.

The movable defence consists of the central ship of the movable defence, and of the torpedo-boats assigned to the local defence, either in commission or in reserve.

The movable defence is commanded by a Captain (Frigate), assisted by a Naval Lieutenant as Adjutant (who is specially charged with the central ship, and with the torpedo-boats in reserve, and also with the instruction of the *personnel* not employed with the machinery), and by one or more torpedo artificer officials. The Commanders and crews of the torpedo-boats assigned to the defence are also under his immediate orders. These crews form administratively in every port a separate crew, charged with a special rôle; they are organized into a company which is commanded by the Naval Adju-

tant above mentioned. This company includes a torpedo gunner and a torpedo engineer, charged with the care of the *matériel* and with the technical *surveillance* of the *personnel*.

The central ship carries provisions for the crew of the torpedo-boats, and should be in a position to furnish them with water, coal, compressed air, and *matériel*.

The torpedo-boats when in commission carry, in addition to the Lieutenant-in-Command, a complement of from seven to sixteen men, according to type, and those of the 1st class, which have two discharge tubes, carry in time of war a Sub-Lieutenant as second in command.

Each torpedo-boat carries one revolver for each of the men on board, two rifles, and a case of surgical-requisites.

The torpedo-boats in reserve are distributed into groups of two; each group has an under-Officer and an engineer, two sub-torpedo gunners (or chief torpedo-men), and from two to four torpedo artificers.

Defence of the Non-Military Ports.

The defence of the ports and coast works which are non-military (naval), up to the present, remains entirely entrusted to the War Department. The local maritime authority and the Commanders of the ships which may be in port, or in the roadstead, are reckoned as being on the Staff of the chief military Officer who is in local command.

Coast Guard.

In order to provide for the semaphore vigilance of the coast during peace and war, there has been established, for more than twenty years along the whole coast, a line of 147 semaphore stations, which are connected with the State telegraph system, and manned by men coming from the Navy. The men belonging to these stations are looked upon as in civil employ, but they are sworn in, and during war time form part of the reserve.

The stations belonging to the coast of each maritime department are under the orders of the Commander-in-Chief of the Department, who, for this purpose, has under his orders a superior Naval Officer, who is styled Inspector of Semaphore Service. Administratively, this service is under the direction of the general Staff (probably central).

Finally, in case of war, there can be employed in the subsidiary *surveillance* of the coast the flotilla employed on protective fishery duties which is stationed along the coast to watch over and control the fisheries and navigation. Both the *matériel* and *personnel* of this service are furnished by the Naval Department.

ITALY.

REGULATIONS FOR CARRYING INTO EFFECT THE ROYAL DECREE, DATED 2ND JANUARY, 1887, ESTABLISHING A COMMAND OF LOCAL MARITIME DEFENCE.

1. The supreme authority in all matters relating to the local sea coast defences is vested in the respective Commanders-in-Chief of the three different Maritime Departments, who will also assume the responsibility for the same.

2. The Director-General of the Arsenal holds authority in the administration of the maritime defences equal to that assigned to him in the direction of public works.

3. He is charged with the maintenance and up-keep of equipments and

stores, so that the local maritime defence may be placed upon a war footing at the shortest notice.

4. He will submit for the approval of the Commander-in-Chief of the Department a list of the complement borne and its distribution on various duties, including the Staff proposed to be allotted for duty in the event of action, also a programme of the usual and exceptional training exercises.

The Commander-in-Chief will forward to the Admiralty copies of these lists with any remarks or suggests he may think fit to add thereto.

5. The Director-General will hold an inspection, every six months at least, of the staff, stores, and equipments belonging to this service, reporting the result to the Commander-in-Chief for the information of the Ministry of Marine.

Captain of the Local Maritime Defences.

6. This Officer will have under control the whole staff and equipment of the service, whether permanent, or temporary, as well as the fixed complement of the central vessel which is under his command.

7. He will direct the training exercises, issue the special instructions that may be necessary relating thereto, and watch over the proper maintenance and up-keep of equipments and stores.

8. He is to report verbally every week, and in writing every three months, to the Director-General of the Arsenal as to the condition of the local defences, the working of the regulations, and any modifications of the same he may think of advantage to the Service.

9. Once a year, or oftener if necessary, he shall submit for the approval of the Commander-in-Chief—

- (a.) The programme and time tables of instruction and service.
- (b.) The registers of muster, of preparatory action, and of full fighting strength.
- (c.) Any modifications to be made in the equipments or staff of the force assigned.

10. He will be *ex officio* a member of the Local Defence Committee, and in the first Maritime Department (Spezzia) he may be nominated by the Commander-in-Chief to join the permanent Committee on War Materials when matters relating to the local marine defence are under consideration.

Lieutenant and Secretary.

11. The Lieutenant acting as Secretary to the Officer commanding the local maritime defences will keep a record of the course of training exercises and experiments, and will have in his custody the technical records pertaining to this command.

He is to be allowed an assistant of the rating of petty officer.

Paymaster.

12. The Paymaster assigned to the service of local coast defences is financially accountable according to the rules laid down for the guidance of Accountant Officers of the Royal Navy, and will have charge of the general records of this command.

He may be allowed for assistants a Sub-Accountant Officer and a petty officer.

Lieutenant in Charge of Central Ship.

13. A Lieutenant is in exclusive charge of the central ship and of the permanent crew, and is charged, subject to the Captain of the local maritime

defences, and of the Captain of the stationary defences, with all the duties of Commander of a Royal war vessel.

Captains of the Stationary and Mobile Defences.

14. The Captains of the stationary defences and of mobile defences are subordinate to the Commanding Officer of the local maritime defences.

They are responsible to the Commanding Officer of the local defences for the maintenance and up-keep of stores and equipments, and instruction of their staff.

15. The Captain of the stationary defences has under his orders :—

- (a.) An adequate staff of subordinates.
- (b.) A detachment of the local maritime defence.
- (c.) The reserves allotted to the stationary defences.

16. If for exceptional works or for war purposes in connection with the local maritime defences an eventual reinforcement of the force should be necessary, it must be provided through the direction of the Commander-in-Chief from the corps of Royal Reserves, and an additional daily allowance shall be made to the men so provided as laid down in Article 9 of the Royal Decree of 20th July, 1879.

This exceptional pay does not apply to the case of men borne for purposes of instruction only.

Mobile Defences.

17. The following are subordinated to the head of the mobile defences :—

- (a.) A Naval Lieutenant.
- (b.) The Chief Engineer assigned to this service.
- (c.) The crew and Officers of the central ship.
- (d.) The complements of the torpedo-boats belonging to the mobile defences.
- (e.) The crews of the tugs, pontoons, steamboats, and other small craft assigned to this defence.
- (f.) The complement borne in the shore depôts of stores and materials for the mobile defences.

18. The Lieutenant borne for purposes of the mobile defence will have more especially as his duty the instruction of the whole staff, excluding the men belonging to the armed torpedo-boats.

19. The Chief Engineer of the mobile defences is charged with the duty of attending to the proper preservation of the machinery belonging to the torpedo-boats, and to the technical instruction of the crews.

He is also to satisfy himself as to the competency of the stokers and others, and occasionally to join the torpedo-boats in sea practice.

He is to acquaint the Commanders of the torpedo-boats of the results of his observations as to the capacity of their machinery and men, and subsequently to lay the same before the Commanding Officer of the mobile defences either verbally or in writing as may be most desirable.

Crews of Torpedo-Boats.

20. The low strength crews of the torpedo-boats and other vessels of the mobile defences shall as a rule be drafted from the reserves.

21. The complement of Officers and men assigned to the local defences is to be calculated upon the number of torpedo-boats that continue in permanent commission.

In addition, the complement of men for at least one boat may be allowed for each group of three torpedo-boats remaining unequipped.

As far as the exigencies of the Service permit of it the complements fixed are not to be varied.

They shall be entered in a special register in the reserve muster rolls headed "Register of Torpedo-boat Crews."

22. In the enrolment of men to form crews of torpedo-boats for local defence, preference shall be given for soldiers or marines born or domiciled in the neighbourhood.

A notation shall be made in the muster lists of those men who have deserved favourable mention when forming part of the crew of a torpedo-boat.

23. The complement allotted in time of peace to local defence in each Department, and the permanent ship's company of the central ship, shall take up their quarters on the central ships.

The annexed Tables I, II, III indicate the scale of subsidiary allowances in respect of the same.

24. The charge of the dépôts on shore of materials and stores for the mobile defences, shall be given in preference either to soldiers of the local detachment for marine defences or to seamen from the arsenal belonging to the gunner or torpedo class.

25. The general muster lists of the local maritime defence comprise —

- (1.) The list for normal service fixing the distribution of the staff, and the duties of those in charge of the maintenance and up-keep or the stores in time of peace.
- (2.) The list for preparatory action fixing the staff necessary for promptly placing the defence upon a war footing, for the laying of submarine mines, lines of torpedoes, sunken barriers, &c.
- (3.) The list of the full war strength once the defences are placed upon a war footing.

26. These lists should be so combined as to obtain the advantages of the promptest action in emergency together with the greatest economy in the number of men borne for service ; thus it might be practicable, for instance, to entrust the same Officers, either in time of peace or during hostilities, with the charge of materials, stores, &c. The complement to be borne on the ordinary peace footing shall be decided annually by the Admiralty on the recommendation of the Commander-in-Chief, as also the numbers and ratings of the men to be furnished from the Reserves to complete the lists, of preparatory action, and full war strength.

Practice and Instruction.

27. The orders for the carrying out of the exceptional exercises and manœuvres which most nearly approximate to actual warfare are to emanate from the Commander-in-Chief, who will thus assure himself of the efficacy of the store and materials of all kinds belonging to the local marine defence, as also of the degree of fitness and capacity of the staff.

The routine of periodical practices and exercises shall be drawn up by the Commanding Officer of the Local Defences and submitted for the approval of the Admiralty through the Commander-in-Chief.

The details are to be assimilated to those contained in the Military Regulations.

Extraordinary Inspection.

28. The service shall be so regulated that at any period of the year, and at the shortest notice, the local defences may be placed either on a partial or complete war footing.

By means of these Extraordinary Inspections directed as often as necessary by the Admiralty, it can be ascertained that every branch of this service is being properly conducted.

29. The duties of Accounting Officer for stores and equipments belonging to the local defences are laid down in the Regulations established for Accountant Officers of the Royal Navy.

Slight repairs should be carried out generally by the local staff, and if through the Direction of Works, the approval of the Commander-in-Chief is to be obtained, a survey is to be held upon stores and damaged materials, the repairs of which would involve more than one month's labour.

Committee on Torpedo-Boats.

30. The Committee for Torpedo-boat trials will be composed as follows:—

Head of the Mobile Defence.
Chief Engineer of the Mobile Defence.
Officer Commanding the Torpedo-boat.

This Committee will meet each time a new torpedo-vessel is commissioned for the local defences, or is docked for repairs.

Provisional List of the Staff assigned in Time of Peace to the Local Defence of Spezzia.

Rating.	Spezzia.			Total.
	Stationary defences.	Mobile defences.	Permanent company of central ship.	
Captain, 1st Class, in command of Local Defence and of the Central Ship		1	..	1
Captain, 2nd Class, in command of Stationary and Mobile Defences	1	1	..	2
Lieutenant.....	3	2	..	5
".....	..	..	1	1
Sub-Lieutenant.....	..	..	2	2
Chief Engineer, 1st Class.....	..	1	1	2
Surgeon.....	..	..	1	1
Paymaster, 1st Class.....	1	..	..	1
" 2nd ".....	1	..	..	1
Chief Pilot.....	..	..	..	..
Boatswain, 1st Class.....	..	..	1	1
" 2nd ".....	2	2	1	5
Boatswain's mate.....	..	..	2	2
Seaman, 1st Class.....	5	2	12	19
" 2nd ".....	5	2	12	19
" 3rd ".....	10	4	12	26
Chief gunner, 1st Class.....	..	..	1	1
" 3rd ".....	1	..	..	1
Chief gunner's mate.....	1	..	..	1

Provisional List of the Staff—continued.

Rating.	Spezzia.			Total.
	Station-ary defences.	Mobile defences.	Per-manent company of central ship.	
Gunner's mate.....	4	..	..	4
Seaman gunner, 1st Class	10	..	6	16
" " 2nd "	10	..	6	16
Torpedo Officer, 1st Class .....	..	..	1	1
" " 2nd "	1	1	..	2
" " 3rd "	2	..	..	2
Chief torpedo artificer, 2nd class	3	1	..	4
Torpedo artificer.....	6	2	..	8
" man, 1st Class	25	2	1	28
" " 2nd "	25	2	..	27
" " 3rd " .....	..	..	..	..
Engineer, 1st Class.....	1	..	1	2
" " 2nd "	2	1	1	4
" " 3rd "	2	1	2	5
Leading stoker.....	..	..	1	1
Fireman, 1st Class	5	4	8	17
" " 2nd "	5	4	8	17
Master-at-arms.....	..	..	1	1
Sailmaker, 1st Class .....	..	..	1	1
Mechanic rating, for service with guns.....	..	..	1	1
" " " " " "	1	..	..	1
" " " " " torpedoes .	..	1	..	1
Chief Quartermaster .....	..	1	1	2
Quartermaster.....	..	1	..	1
Sick berth steward .....	..	..	1	1
Clerk.....	..	..	1	1
Cook .....	..	..	1	1
Total.....	130	3 35	88	256

Monthly Supplementary Allowances.

	No.	Amount.	
		Francs.	Cents.
<i>Establishment Allowance.</i>			
Commander of Local Defences and of the Central Ship	1	24	..
Lieutenant in charge of the Central Ship	1	24	..
Surgeon of the Central Ship	1	5	..
Paymaster	1	10	..
<i>Supplementary Allowances.</i>			
Officers in charge of depôts	3	10	20
Chief Pilot	1	10	20
„ boatswain	1	10	20
„ gunner	1	10	20
„ torpedo officer	1	10	20
„ sick berth steward	1	10	20
„ „	1	10	20
„ Quartermaster, and warrant officer for duty as secretary	2	7	50
2nd Quartermaster	1	5	40
Ship's cook	1	10	20
Other ratings	24	3	..
Sick berth steward	1	5	40

Provisional List of the Staff assigned in Time of Peace to the Local Defence of Venice.

Rating.	Venice.			Total.
	Station-ary defences.	Mobile defences.	Per-manent comple-ment of central ship.	
Captain, 1st Class, in command of Local Defences and Central Ship	1		..	1
Captain, 2nd Class, in command of Station-ary and Mobile Defences	1	1	..	2
Lieutenant	2	1	..	3
" in charge of Central Ship.....	..	..	1	1
Chief Engineer, 1st or 2nd Class .....	..	1	..	1
" 2nd Class .....	..	..	1	1
Surgeon, 2nd Class .....	..	..	1	1
Paymaster, 1st Class	1		..	1
" 2nd Class.....	1		..	1
Chief Pilot, 3rd " .....	..	..	1	1
Boatswain " "	1	..	1	2
"	1	1	..	2
Boatswain's mate.....	..	..	2	2
Seaman, 1st Class	4	1	3	8
" 2nd "	4	1	3	8
" 3rd "	4	2	4	10
Chief gunner, 3rd Class	1	..	..	1
Chief gunner's mate .....	..	..	1	1
Gunner's mate.....	2	..	..	2
Seaman gunner, 1st Class.....	7	..	1	8
" 2nd "	7	..	1	8
Warrant officer for torpedo duties, 1st, 2nd, or 3rd Class	1	..	..	1
Warrant officer for torpedo duties	2	1	1	4
" " " "	3	1	..	4
Torpedo-man, 1st Class	10	2	1	13
" 2nd "	20	2	..	22
Engineer, 1st Class.....	1	..	1	2
" 2nd "	1	1	..	2
" 3rd "	1	1	1	3
Stoker, 1st Class	2	2	2	6
" 2nd "	2	2	3	7
Master-at-arms .....	..	..	1	1
Mechanic rating for service with guns .....	..	..	1	1
" " " " torpedoes ..	1	1	..	2
Chief Quartermaster.....	1	..	..	1
Quartermaster.....	1	1	..	2
Sick berth steward .....	..	..	1	1
Clerk.....	..	..	1	1
Ship's cook.....	..	..	1	1
Total	80	3 22	34	139

Monthly Supplementary Allowances.

	No.	Amount.	
		Francs.	Cents.
<i>Establishment Allowance.</i>			
Officer Commanding Local Defences and Central Ship	1	24	..
Lieutenant in charge of Central Ship	1	12	..
Surgeon.....	1	3	..
Paymaster	1	7	..
<i>Supplementary Allowances.</i>			
Officers in charge of materials, stores, &c.	3	7	50
Chief Pilot	1	7	50
„ boatswain	1	7	50
„ gunner.....	1	7	50
„ torpedo stores.....	1	7	50
„ sick berth steward.....	1	5	20
„ Quartermaster and secretary	1	6	..
2nd Quartermaster.....	2	4	50
Ship's cook.....	1	5	10
Other ratings.....	12	3	..

Provisional List of the Staff assigned in Time of Peace to the local Defence of Naples.

Rating.	Naples.			Total.
	Station-ary defences.	Mobile defences.	Perma-nent comple-ment of central ship.	
Captain, 1st Class, commanding the Station-ary and Mobile Defences and the Central Ship	1		..	1
Lieutenant .....	..	1	..	1
" .....	..	..	1	1
Chief Engineer, 2nd Class .....	..	1	..	1
Surgeon, 2nd Class .....	..	..	1	1
Paymaster, 1st "	1		..	1
" 2nd "	1		..	1
Boatswain, 3rd " .....	..	..	1	1
Boatswain's mate	1	1	..	2
Seaman, 1st Class	2	1	4	7
" 2nd "	2	1	6	9
" 3rd "	2	2	6	10
Chief Gunner, 3rd Class .....	..	..	1	1
Chief Gunner's mate	1	..	..	1
Gunner's mate	5	..	2	7
Seaman gunner, 1st Class	5	..	2	7
" 2nd "	5	..	4	9
Chief warrant officer for torpedo duties ..	..	..	1	1
Petty officer for torpedo duties .....	..	1	..	1
Leading torpedo man .....	..	1	..	1
Torpedo man, 1st Class .....	..	2	1	3
" 2nd " .....	..	2	..	2
Engineer, 1st class .....	..	..	1	1
" 3rd " .....	..	1	1	2
Chief engine-room artificer .....	..	..	1	1
Stoker, 1st Class .....	..	2	2	4
" 2nd " .....	..	2	6	8
Engine-room artificer .....	..	..	1	1
Master-at-arms .....	..	..	1	1
Sailmaker .....	..	..	1	1
Chief Quartermaster .....	..	1	..	1
Quartermaster .....	..	1	..	1
Sick berth steward .....	..	..	1	1
Clerk .....	..	..	1	1
Ship's cook .....	..	..	1	1
Total	23	3 20	47	93

Monthly Supplementary Allowances.

	No.	Amount.	
		Francs.	Cents.
<i>Establishment Allowance.</i>			
To the Commanding Officer of the Stationary and Mobile Defence and of the Central Ship	1	24	..
„ Lieutenant in charge of Central Ship	1	12	..
„ Surgeon, ditto	1	3	..
„ Paymaster, ditto	1	7	..
<i>Supplementary Allowances.</i>			
„ Officers in charge of materials, equipment, &c.	3	7	50
„ Chief Pilot	1	7	50
„ Chief boatman in charge	1	7	50
„ „ gunner	1	7	50
„ „ warrant officer for torpedo service	1	7	50
„ „ sick berth steward	1	5	20
„ „ „	1	7	50
„ „ Quartermaster, acting as secretary	1	6	..
„ „ „	1	4	..
„ „ „	1	6	..
„ ship's cook	1	5	10
„ other ratings	8	3	..

Ministerial Decree creating Principal and Secondary Torpedo Stations.

"In view of the Royal Decree of 16th January, 1867.—The following principal and secondary torpedo stations are hereby established for the purposes of coast defence.

Principal stations.	Secondary stations.
1. Venice.	
2. Ancona.....	(1) Porto Corsini.
	(2) Unsettled.
	(3) Tremiti.
3. Brindisi.....	(1) Manfredonia.
	(2) Bari.
	(3) Otranto.
4. Taranto.....	(1) Gallipoli.
	(2) Cotrone.
5. Augusta.....	Syracuse.
6. Messina.....	Milazzo.
7. Palermo.....	(1) Trapani.
	(2) Marsala.
8. Maddelena.....	Cagliari.
9. Naples.....	(1) Salerno.
	(2) Gaeta.
10. Cape Miseno.	
11. Civito Vecchia.....	Port St. Stephano.
12. Livorno.....	Porto Ferraio.
13. Spezzia.....	Genoa.
14. Savona.....	Oneglia.

PROVISIONAL REGULATIONS FOR THE TORPEDO STATIONS.

*Requirements to be fulfilled.**Principal Torpedo Stations.*

1. The principal stations should be so organized and equipped as—
 - (a.) To afford a safe shelter for at least nine coast torpedo-boats.
 - (b.) To be within easy distance of workshops for minor repairs.
 - (c.) To possess means for laying up in dry dock at least one torpedo-boat or to be in close proximity to a suitable locality for the same.
 - (d.) To command a sufficient supply of fresh water for the use of the torpedo-boats belonging to the station as well as for the needs of the staff.
2. Each principal station should moreover contain—
 - (a.) A magazine for the custody of twelve torpedoes and charges.
 - (b.) " " Mitrailleuse guns, weapons for the crews of nine torpedo-boats, ammunition, &c.
 - (c.) A magazine for coal.
 - (d.) " victuals of a capacity of 2,000 rations.
 - (e.) A dormitory for thirty-six men.
 - (f.) " six petty Officers.
 - (g.) A kitchen for forty-eight men and 12 Officers with the necessary repositories, cupboards, lockers, &c., for the provisions, kitchen utensils, &c.

3. The list of fittings, utensils, to be provided for the use of each principal station as shown on Table A.

4. Each principal station is also to be provided—

- (a.) With a pneumatic steam pump for the charging of torpedoes.
- (b.) With a complete signal mast, and signalling apparatus, including storm warnings.
- (c.) Spare fire-box (Very's).
- (d.) „ small steam whistle for acoustic signals.
- (e.) „ gun for signalling, with removable carriage.

Secondary Stations.

5. The secondary stations should be so organized and equipped as—

- (a.) To afford safe shelter for at least three torpedo-boats.
- (b.) To command a sufficient supply of fresh water for at least three torpedo-boats and their crews.
- (c.) To contain stores of coal and fuel for the refitting of at least three torpedo-boats.
- (d.) Quarters for the Accounting Officer in charge and his assistant.
- (e.) Signalling mast and apparatus.
- (f.) The list of fittings, utensils, &c., to be provided for the use of each secondary station is shown in Table B.

6. The principal torpedo stations are subordinate to the Commanding Officer of the Maritime Department in whose coast they may be situated, and are constituted both for military and administrative purposes, as local maritime commands.

Jurisdiction of the Stations.

7. The military jurisdiction of each principal station extends along the whole extent of coast allotted to it, as shown in Table C, comprising also the respective secondary stations.

Command of the Stations.

8. The command of each principal station devolves upon the senior Officer serving on the station.

Duties of a Commander of a Station.

9. The Commander of a station holds all the authority and position of Commander of a ship, and that of a local maritime command.

The same regulations, as regards discipline and administration, will apply to him as to the above, either in his relations towards the Commander-in-Chief, or the departmental authorities, military or civil authorities, or his subordinate staff.

10. The Commander of a station should secure the proper care and maintenance of all the stores and equipments of the principal and secondary stations dependent thereupon, and to ensure that the torpedo-boats shall be prepared for sea at the briefest notice.

11. He must zealously attend to the instruction and discipline of his men, following closely the routine of practice laid down by the Commander-in-Chief.

12. He must keep a constant look out, and watch along the coast, and in case of accidents at sea, may render the assistance compatible with the essentially military scope of the station, and the means at his command.

13. He is to see that the principal and secondary stations maintain, as far

as possible, by means of signal flags, communication with the signalling semaphores, and with the Royal war vessels and torpedo-boats in sight, and that storm signals be displayed when necessary.

14. In the event of war, when a semaphore station is not visible, he must establish a constant communication both with the nearest one, and also with the nearest telegraph station, detaching one or more of his men for that duty.

15. He is also to keep a watch over the semaphoric posts and works for coast defence belonging to the administration of the Navy along his extent of coast, and once a month at least he will proceed in a torpedo-boat to inspect the above, as well as the secondary stations, informing the Commander-in-Chief of the result.

16. The Lieutenant commanding the torpedo-boats allotted to the principal stations should as often as practicable follow a course of manœuvres with several boats, taking every opportunity to familiarize his men with the coast.

17. The staff of the principal stations shall correspond to the number of armed torpedo-boats assigned to them, with the addition of an Officer of lesser grade for charge of the dépôts on shore, and Accountant Officer of the same, one or more seamen, and the *personnel* of the stationary defences.

18. Only a petty officer for accountant purposes and a seaman assistant are borne for charge of the secondary stations.

19. In deciding upon the staff to be allotted to the respective stations, preference is to be given to men who are natives of the locality, or whose families reside on the spot.

20. No change shall take place between the higher grade officials of the stations, except for reasons of health, or purposes of discipline, or for special service exigencies, and in the latter case the approval of the Commander-in-Chief of the Department must first be obtained.

21. The crews of the torpedo-boats on the principal stations shall, as a rule, sleep on shore in the quarters allotted for the purpose, excepting, however, the men who are left in charge of each boat for the night.

22. An armed watch shall be maintained over the dépôts of explosives, and in time of war a service of sea vigilance, and watch over the semaphoric stations.

A portion of the crews of the torpedo-boats, and some men belonging to the station, may be told off for this purpose.

23. In time of peace this duty shall be carried out by the guard over the dépôt of explosives, and in their absence by the Sub-Accountant Officer and his assistants, who should be competent to read the signals from war ships in the distance, or semaphoric stations.

24. In the event of it becoming necessary to inflict any disciplinary punishment upon one of the complement of the station, and for which purpose no suitable place of confinement is available, nor can the delinquent be transferred to the military authorities of the locality, in that case he is to be transferred for punishment to the departmental headquarters without delay, and a special report of the case forwarded with him.

25. As regards the sanitary condition of the station, sickness amongst the staff, &c., the Officer commanding the station will follow the regulations applicable to vessels of the Royal Navy, utilizing if necessary the nearest military or civil hospital.

26. The Officer appointed for that purpose (of petty rank) will account for the stores and materials on the station.

27. The victualling of the reserve crews of torpedo-boats shall be the same as that allowed for those actually manned and equipped.

28. Both as regards the revictualling of these crews and the general administration of the stores, &c., on the station, the rules established by the code for the direction of works shall be observed.

TABLE A.—*Provisional List of the Utensils, &c., of a Principal Station.*

No.	Denomination.	Value.	
		Partial.	Total.
<i>Seaman's Dormitory and Kitchen.</i>			
		F. c.	F. c.
30	Bedsteads	16 0	48 0
3	Pine dining tables	16 0	48 0
6	Wooden benches	5 0	30 0
6	" "	4 0	24 0
1	Cauldron	35 0	35 0
1	"	35 0	35 0
1	Boiler	5 25	5 25
1	Stool	3 0	3 0
1	Mill	5 0	5 0
3	Ladles, of sizes	3 75	11 25
2	Large lanterns . . . . .	..	..
2	Hand " . . . . .	..	..
2	"	4 0	8 0
1	Grater	5 0	5 0
1	Barrel or cask (50 litres)	5 0	5 0
1	Washing tub	2 50	2 50
2	Tubs	2 0	4 0
2	Barrels for wine	5 0	10 0
2	" water	5 0	10 0
1	Pint measure	1 75	1 75
1	$\frac{1}{2}$ pint measure	1 50	1 50
1	$\frac{4.5}{100}$ pint measure	1 25	1 25
2	"	4 0	8 0
6	Canvas aprons	2 0	12 0
2	Canvas sacks	5 0	10 0
1	Hatchet for wood	4 0	4 0
4	Hampers for provisions	4 50	18 0
2	Iron pickaxes	6 0	12 0
1	"	3 0	3 0
1	Metal coffee-sieve	4 0	4 0
1	Large cleaver	3 0	3 0
1	Small "	2 0	2 0
1	Cheese cutter	3 0	3 0
1	Scales	12 0	12 0
1	Large funnel	2 25	2 25
1	Small "	2 0	2 0
1	Sundry utensils	10 0	10 0
		..	350 75
<i>For the Dormitory, Mess, and Kitchen of the Lower Officials.</i>			
8	Common straw chairs	1 50	12 0
2	Looking-glasses	9 0	18 0
2	Iron stands for basins	2 0	4 0

No.	Denomination.	Value.	
		Partial.	Total.
		F. c.	F. c.
	2 Iron frames.....	10 0	..
	11 Yards material for mattresses.....	20 90	..
	1 " " pillows	1 90	..
	12 Kilogrammes wool for mattresses...	39 0	..
	2 " " pillows.....	6 50	..
	2 Pine planks.....	5 0	..
	15 Kilogrammes vegetable horsehair for mattresses.	3 0	..
6	Beds, complete	86 30	517 80
2	Iron basins	3 0	6 0
2	Milk pans	2 50	5 0
2	Pine lockers with drawers.....	25 0	150 0
1	Soup tureen, tinned iron	5 0	5 0
1	Earthenware salad bowl	3 0	3 0
1	Oval earthenware dish.....	2 25	2 25
12	" " soup plates.....	0 30	3 60
24	Plates	0 28	6 72
18	Small ditto	0 25	4 0
8	Drinking tumblers.....	0 50	4 0
8	Glass wine decanters	0 75	6 0
2	Saltcellars	1 0	2 0
8	Plated spoons and forks	6 50	50 0
8	Black-handled knives.....	1 0	8 0
1	Ladle.....	5 0	5 0
1	Salad spoon and fork.....	2 0	2 0
3	Tablecloths.....	6 0	18 0
24	Napkins.....	0 70	16 80
8	Tin drinking cups	1 25	10 0
8	" saucers.....	1 50	12 0
8	Napkin rings.....	1 0	8 0
6	Dusters	1 0	6 0
6	Canvas aprons	2 0	12 0
1	Cauldron, copper	10 80	10 80
1	Saucepan	15 25	15 25
1	"	10 80	10 80
1	Pie dish.....	8 70	8 70
1	Frying pan.....	3 50	3 50
2	Cooking spoons	1 75	3 50
2	Iron skimmers	0 75	1 50
1	Cleaver, large.....	3 0	3 0
1	" small	2 0	2 0
1	Grater	3 0	3 0
1	Barrel for wine	5 0	5 0
1	" water.....	5 0	5 0
2	Funnels.....	0 85	1 70
1	Pannikin.....	2 50	2 50
1	Gridiron	3 50	3 50
6	Baking dishes.....	1 0	6 0
1	Toasting fork	1 50	1 50
	Total.....	..	994 92

TABLE B.—*Provisional List of Utensils, &c., for a Secondary Station.*

No.	Denomination.	Value.	
		Francs.	Cents.
<i>Dormitory and Kitchen.</i>			
3	Beds .....	..	..
1	Table	15	..
3	Chairs .....	..	..
1	Cauldron	7	..
1	Kettle	15	..
1	"	7	50
1	Stool	2	40
1	Mill	8	..
3	Ladles, of sizes	1	50
1	Large lantern	10	..
1	Small ditto	4	..
1	Grater	1	25
1	Barrel (50 quarts)	6	..
1	" (wine)	8	..
1	" (water)	4	..
1	Quart measure .....	..	80
1	Pint .....	..	60
1	Half-pint .....	..	40
1	Chopper, for wood	2	50
1	Tin-box	2	..
1	Hamper, for provisions	6	..
2	Pickaxes	2	80
1	Percolator	2	40
1	Metal coffee sieve .....	..	90
1	Cleaver (large)	2	..
1	" (small) .....	..	80
1	Cheese-cutter	1	20
1	Scales (40 kilogrammes)	12	..
1	Funnel	1	20
1	" .....	..	50
1	Sundry utensils	5	..
1	Canvas bag	1	70
2	Wooden lockers	228	..
Total		360	45

TABLE C.—*Extent of Coast assigned to each Principal Station and Jurisdiction of the same.*

Station No.	Name.	Limits of operation.
1	Venice	From the Austrian frontier to the mouth of the Po.
2	Ancona	„ Mouth of the Po at Primaro to Point Gargano.
3	Brindisi.....	„ Point Gargano to Cape St. Maria di Leuca.
4	Taranto.....	„ Cape St. Maria di Leuca to Cape Spartivento.
5	Augusta	„ Riposto to Porto Empedocle.
6	Messina.....	„ Riposto to Cape Orlando, including the Archipelago of Lipari, and from Cape Spartivento to Cape Suvero.
7	Palermo	„ Cape Orlando to Porto Empedocle.
8	Maddalena	Sardinia and adjacent islands.
9	Naples.....	From Cape Suvero to Monte Circello, exclusive of the Gulf of Pozzuoli, and islands between Point Campanella and Monte Circello.
10	Miseno	The Gulf of Pozzuoli and islands above mentioned.
11	Civita Vecchia....	From Monte Circello to Monte Argentario.
12	Livorno.....	„ Monte Argentario to the mouth of the Arno, including all the Tuscan islands.
13	Spezzia	„ the mouth of the Arno to Voltri.
14	Savona	„ Voltri to the French frontier.

Royal Ordinance, No. 4374, instituting Local Maritime Commands in Fortified Places, Seaports, Harbours, &c., in addition to those existing at Departmental Headquarters.

“In view of the law of 3rd July, 1884, and Royal Decree of January, 1887, instituting a gunnery and torpedo service for local defence, and the decree of January, 1887, creating torpedo stations along the coasts of the Kingdom, &c.”

It is decreed further :—

1. That local maritime commands shall be created along the coasts in various fortified places, seaports, harbours, &c., more or less dependent on the protection of the Royal Navy, as may be found desirable.

The stationary and mobile defence service shall be assigned to these purposes, and the different commands to be established shall be decided upon by degrees, as the local marine defences at various points are suitably developed.

2. The command of the local maritime defences is directly subordinate to the authority of the Commander-in-Chief.

3. The Captain of the local marine defences also commands the central ship destined for local defence, and is charged with the same functions as those laid down in the regulations for Commanding Officers of defences, at departmental headquarters.

4. To this Officer are directly subordinate—

- (a.) The Commander of the torpedo station and head of the mobile defence.
 - (b.) The whole ship's company of the central vessel for local defence, or any members of the service of stationary defences, though afloat.
5. The vessels belonging to the local defence may, for administrative purposes, be considered as being in reserve.
The staff and equipment shall be regulated by the Minister of Marine according to the local needs.
6. The regulations for the service of the local defence vessels shall be laid down in a code which shall receive the sanction of the Minister of Marine.
This decree shall be registered in the national archives.

Regulations for giving effect to the Royal Decree of February, 1887, establishing Local Maritime Commands in addition to those at the Departmental Headquarters.

1. The Officer commanding the local defences combines all the functions of commander of a man-of-war and those of the chief of a maritime local command.

The same rules of discipline and administrative powers apply to him as to them, either in his relations to the Commander-in-Chief, or towards the departmental authorities, or the staff subordinate to his control, or finally, towards the military or civil authorities of the district.

2. This Officer is responsible for the maintenance and up-keep of the war materials and stores, as well as for the instruction of his staff, so that the local marine defence may always be most advantageously applied.

3. He will submit for the approval of the Commander-in-Chief of the department a list of the complement and its distribution on various services, including the staff proposed to be allotted for duty in the event of action; also a programme of the normal and exceptional training exercises.

The Commander-in-Chief will forward to the Admiralty copies of these lists, with any remarks or suggestions he may think fit to add.

4. Once a month a report is to be made to the Commander-in-Chief, in writing, as to the condition of the local defence service, and the degree of efficiency of the staff.

5. The commanders of the stationary defences and of the mobile defences are subordinate to the Commanding Officer of the local defences, and responsible to him for the maintenance and up-keep of the war materials in their charge, and for the instruction of their men.

6. In addition to the above, the Commanding Officer of the local defences holds authority over the men and equipments of the semaphore stations, and of the defensive works and torpedo stations that are found within the jurisdiction of his coast-line.

7. He must keep up a constant look out, and in the case of a disaster at sea shall render any assistance in his power.

8. The Captain of the stationary defences has under his authority the staff assigned to that service, and will be responsible for the maintenance of his stores and material, and the efficiency of his men.

9. The Captain of the mobile defences is similarly responsible to the Commanding Officer of the local defences.

10. The central ship must maintain, as far as possible, steady communication with the semaphore stations, the men-of-war, and torpedo vessels in sight; and in time of war, with the nearest telegraphic station, a subordinate being detached for that purpose.

11. The materials and stores of the mobile defences include the torpedo-

boats and stores belonging to them. The staff consists of the crews of the torpedo-boats and the men in charge of the dépôt and stores.

12. The Commanding Officer shall issue frequent directions to the Captain of the mobile defences, so that the latter may practise repeated evolutions with the torpedo-boats, either singly or in company, and may take every occasion to afford his men an exact knowledge of the coast.

13. The paymaster of the central ship renders accounts in addition of all the stores belonging to the stationary or mobile defences.

The Chief Engineer of the central ship for local defence is charged with the duty of seeing that the engines of the torpedo-boats and others belonging to the local defences are kept in a state of due preservation and repair.

15. The complements allowed for torpedo-boats shall be calculated according to the number of boats actually equipped, and in commission; but in addition, one complete crew may be allowed for each group of three torpedo-boats remaining unequipped.

These complements are not to be varied in any particular, except under special circumstances and for service reasons; they shall be entered in a special register in the reserve muster rolls, headed "Register of Torpedo-boat Crews."

16. In forming crews of torpedo-boats for local defence, the preference shall be given to men born or domiciled in the neighbourhood, and a note shall be made in the muster lists of those men who have deserved special mention when forming part of the crew of a torpedo-boat.

17. The rules relating to the general formation of the lists of service for local maritime defence, instruction, manœuvres, and practice are the same as those established by the Royal Decree instituting commands of this nature at the headquarters of the departments.

18. The Commander-in-Chief, or other Officer of superior rank deputed by him, shall satisfy himself, by means of inspections held from time to time, of the condition of the service of local maritime defence, on the various stations along the coast under his jurisdiction.

Royal Ordinance creating a Local Maritime Command in the Estuary of Maddalena, Sardinia.

"In view of the Royal Ordinance of February, 1887, instituting maritime defence commands in fortified places on the coasts, &c.

"A local command is hereby established in the estuary of Maddalena, Sardinia.

"The Minister of Marine is charged with the execution of the above Decree."

Ministerial Decree sanctioning the Provisional Staff assigned in Time of Peace to the Local Defence of Maddalena.

"In view of the Royal Decree of 27th February, 1887, establishing commands of local defence in maritime strongholds, ports, &c., in addition to those at the departmental headquarters.

"The following provisional list of the staff assigned in time of peace to the local defence of Maddalena, and monthly supplementary allowance, is hereby approved":—

Provisional List of the Staff assigned in Time of Peace to the Local Defence of Maddalena.

Rating.	Maddalena.			Total.
	Stationary defences.	Mobile defences.	Permanent company of central ship.	
Captain, 1st Class, in command of the Local Defences and of the Central Ship		1	..	1
Captain of frigate or corvette in command of Stationary and Mobile Defences	1	1	..	2
Lieutenant .....	..	1	1	2
Acting Chief Engineer .....	..	..	1	1
Surgeon, 2nd Class .....	..	..	1	1
Paymaster, 2nd Class .....	..	..	1	1
Chief Pilot .....	..	..	1	1
Boatswain, 2nd and 3rd Class .....	..	..	1	1
" .....	..	1	1	2
Boatswain's mate .....	..	..	2	2
Seaman, 1st Class .....	..	1	2	3
" 2nd " .....	..	1	2	3
" 3rd "	2	2	12	16
Chief gunner, 2nd Class .....	..	..	1	1
Acting chief gunner .....	..	..	1	1
Seaman gunner, 1st Class	2	2	..	4
" 2nd "	2	2	..	4
Chief torpedo officer, 2nd Class	1	..	..	1
Junior "	1	1	..	2
"	2	1	..	3
Torpedo-man, 1st Class	4	2	..	6
" 2nd "	8	2	..	10
Engineer, 1st Class .....	..	..	1	1
" 3rd " .....	..	1	..	1
Chief stoker, 2nd Class .....	..	..	1	1
Stoker, 1st Class .....	..	2	4	6
" 2nd " .....	..	2	4	6
Master-at-arms .....	..	..	1	1
Mechanic rating for service with torpedoes ..	2	..	..	2
" .....	..	1	1	2
Sick berth steward .....	..	..	1	1
Clerk .....	..	..	1	1
Cook .....	..	..	1	1
Total	25	1 23	42	91

Monthly Supplementary Allowances.

	No.	Amount.	
		Francs.	Cents.
<i>Establishment Allowance.</i>			
The Officer commanding the local defences	1	24	..
Lieutenant in charge of central ship	1	12	..
Surgeon.....	1	3	..
Paymaster.....	1	7	..
<i>Supplementary Allowances.</i>			
The Officer in charge of stores, &c., for local defences.....	3	7	50
Chief Boatswain	1	7	50
" Gunner.....	1	7	50
" Torpedo Officer	1	7	50
" sick berth steward.....	1	5	20
Ship's cook.....	1	5	10
Other ratings.....	8	3	..

AUSTRIA.

In Austria, also, coast defence has been an object of attention for several years, and under the vigorous and intelligent impulse of Admiral Sternek it is tending to a rational development. As is known, the whole of the military defence by land and sea is under the orders of the War Administration, of which the Navy forms but a section. This if on the one side it gives rise to some inconveniences, on the other side it assures better one factor of the highest importance, viz., unity of conception and co-operation in execution.

The land defence of the coast is under the orders of the Commander of the Army Corps to which the coast zone belongs, but with the following qualifications :—

The command of the naval fortress at Pola, which is the only naval arsenal of the empire, is entrusted to the Vice-Admiral Commanding-in-Chief of the Admiralty at Pola, who, as such, is under the orders of the Commander of the Army Corps.

The Navy provides to some extent for the manning of the batteries and sea forts of Pola, and entirely for its submarine defence.

At the other points of the coast which may possess military importance and at which maritime interests prevail a Naval Officer acts as commandant of the fortress : whilst at other points at which land interests are more predominant a Naval Officer is detached for service with the commander of the fortress.

For the purpose of external movable defence the coast has been divided into four zones of about 460 kilometres, and to each zone there it assigned a flotilla of torpedo-boats, composed of dépôt ships, torpedo rams, and torpedo-boats.

The magnificent natural harbours of Cattaro and Sebenico are placed in a condition to serve as points of support to the defensive flotillas.

In addition to a portion of the naval element the Navy can dispose of the following forces for military and technical service on land, viz. :—

- (a.) A category of sedentary Naval Officers who form a separate branch and who are recruited from amongst Naval Officers who are no longer suitable in all respects for sea service. The posts which they more especially occupy are those assigned to the commandants of naval fortresses, those connected with naval barracks, the naval academy, and the technical establishments, and those serving as commanders of districts for the naval levy.
- (b.) Corps of ordnance engineers which are charged with the manufacture, proving, and maintenance on land of the naval artillery material, and which are recruited partly from the abolished corps of marine artillery and partly by naval employés (or Officers) who show special aptitude for this service.

The organization for raising men for active service and for the reserves is absolutely identical for the Navy and for the Army. The country is divided into military districts; the coast districts, which furnish the levy for the Navy, are governed by the Naval Officers of the sedentary category; these districts (coast) are under the orders of the military provincial commander in all matters that relate to the levying of the men, and under the Admiralty for administrative and disciplinary purposes.

The services pertaining to the captaincies of the port and of the light-houses and semaphores, like the mercantile marine, are under the orders of the local maritime governor; but a considerable portion of the *personnel* is recruited from individuals who have belonged to the Navy or to the merchant service and, thanks to the sound military organization of the State, who therefore can be easily made use of in case of war, the same may also be said for the naval custom service which, moreover, disposes of several small steam vessels employed in watching the islands and the coasts of the mainland.

The question of organizing a corps of coast artillery is under consideration.

SPAIN.

Although the Spanish Navy after the reverses sustained at the beginning of the present century has had to pass through a period of decay from which it is only now showing signs of recovery, nevertheless, some excellent regulations are still in force which, if judiciously and seriously applied, are capable of being of the greatest utility in the defence of the coasts.

The coast of Spain is divided into Departments called Captaincies-General, under the orders of Admiralty officials, styled Captains-General, who have command of the Military Maritime effective of all the coast in the department, including coast guard duties and police, the fisheries and customs, and the recruiting for the Navy.

The departments are divided into Provinces, or Maritime Captaincies, and these again into districts; these divisions and subdivisions are governed by Naval Officers, who, within the zone of their jurisdiction, at one and the same time are Captains of the local ports, Directors of Naval Recruiting, heads of the local Maritime Military Forces, of the Semaphore Service, of the light-houses and beacons, and of the customs. These Officers, according to the military importance of the zone, belong either to the active list or to the reserve, or they may even be on the retired list. Those of inferior rank (subalterns) are drawn from under-Officers of the Navy or from pilots. These, for judicial and administrative purposes, are aided by employés

belonging to the Corps of Marine Auditors, which in Spain has a considerable variety of duties entrusted to it.

For services connected with local coast defence the Navy can dispose on land of the following *personnel*, viz. :—

- (a.) *Corps of Reserve*.—A special category of sedentary Naval Officers (or employés) formed from Naval Officers, who by reason of age or physical unfitness are no longer suitable for the naval service. To this branch are also attached the under-Officers of the Navy, and pilots who, in consideration of their services, have obtained the rank of Officers, and who may be promoted as high as the rank of Naval Lieutenant.
- (b.) *Corps of Marine Artillery*.—Partly employed on board ship and partly on land.
- (c.) *Corps of Marine Infantry*.—Recently reorganized.
- (d.) *Naval Reserve*.—The Naval Reserve is organized in battalions, and is formed from the 2nd category of the naval levy; it is called out every two years for six weeks' drill.
- (e.) *District Naval Militia*.—Which is composed of individuals who have already complied with their obligations in the levy.
- (f.) *Corps of Marine Volunteers*.—This is recruited from men dwelling on the coast, and is intended not only to supply the ordinary and extraordinary naval armaments, but also to aid in the local defence of the ports.

The Volunteers, the Reserve, and the district Militia are all placed under the command of the respective Commanders of Provinces and of maritime districts, whose duty it is to look after their call to arms and their instruction.

Coast Surveillance.

The service of the semaphores has from of old been under the direction of the Navy, and in 1872 it was definitely reorganized on the model in force in France. The employés in the semaphore service are recruited from graduates and sailors of the Naval Reserve, and are placed under the care of the Commanders of the maritime district within whose limits they happen to be. The telegraphic service and the construction of the stations, however, differing in this respect from the French system, are controlled by the Public Works Department, which takes the necessary steps in accordance with the desires of the Admiralty.

The customs *surveillance* at sea, together with that of the fisheries and navigation, has been, *ab antiquo*, entrusted to the Navy, which maintains for the purpose a coastguard flotilla, which is distributed along the coast, and is under the orders of the local maritime Commander. The flotilla consists of steam vessels, sailing vessels, and row boats, which are manned by graduates (apprentices), sailors and pilots of the Navy, either belonging to the reserve or to the retired lists.

The organization of the Submarine Defence is under consideration.

RUSSIA.

The Russian coast is divided into maritime districts, in each of which an Admiralty Official resides, who may chance as well to be the Military Governor of the District.

The local defence is so organized that in case of war the coast is parcelled out into zones of defence, which are commanded by the Senior Fortress Commander of the zone, or by an Officer nominated for the purpose by the Czar.

In principle, however, the command of the coast fortress and of the adjacent zones is entrusted to a Naval Officer, except at such points where the defence of the land frontier is of preponderating importance.

Russia, however, for the defence and *surveillance* of the coast disposes of a numerous fleet *personnel* greatly in excess of its naval requirements, and of the following forces, viz. :—

- (a.) *Dockyard Officials*.—Consisting of a numerous *cadre* of sedentary Naval Officers, formed by Naval Officers no longer in the ranks or who are not desirous of continuing their service in the Navy, and of discharged under-Officers.
- (b.) *Ships' Complements* (Crews of the Fleet).—Three divisions of ships' complements are permanently destined for coast defence and for service in the lighthouses and semaphores.
- (c.) *Naval Customs Flotilla of the Baltic*.—This is under the command of an Admiralty official, and serves, in addition to preventing the landing of contraband goods, to exercise part of the naval force in navigation along the coast, to look after the service of the lighthouses and semaphores, and to help ships in distress or wrecked. During peace time this flotilla is at the disposal of the Minister of Finance, but in time of war it is supplied with torpedoes and becomes a defensive flotilla reinforced by the torpedo flotilla. The *personnel* is attached to it by turns for two or three years.

It would appear as if the Government was satisfied with this institution and is anxious to organize a similar one for the Black Sea and for the Coast of Siberia. As a matter of fact a project is on foot for the organization of a Cossack coastguard flotilla for the Black Sea, with a view to utilizing the traditional naval aptitude of the hardy Cossack population of the littoral.

Note by Compiler.—A flotilla, which is evidently of a military character, seeing that it is placed under a Naval Officer nominated by the Minister, and furnished with a nucleus of sailors belonging to the Military Marine who are paid by the Government, has recently been established for the passenger traffic between the Caucasian coasts of the Black Sea and the port of Batoum.

- (d.) *Companies of Torpedo Miners* for the fixed submarine defence. These companies are subdivided into small detachments in the various ports. The Officers, graduates, and privates are drawn partly from military engineers and partly from the Navy.
- (e.) *Corps of Custom House Officers*.—This corps, although in time of peace it is under the direction of the Minister of Finance, is recruited from soldiers who have completed one year's service, and who complete the period of their enlistment in this corps. It time of war it passes over to the control of the military authorities, who also take over the expenses of its maintenance.
- (f.) *Coastguard Corps*.—Organized at certain points of the coast for customs and military *surveillance*. It is under the orders of the Chief of the Customs, who in Russia is a personage invested with military rank.

The service of lighthouses, semaphores, lifeboat stations, and of hydrographic signalling stations is under the control of the Navy, and is carried out by men dependent upon it under the *surveillance* of Naval Officers.

The coast defence can count upon a numerous flotilla of torpedo-boats distributed along the coast, and working in conjunction with the Customs Flotilla. In addition to this flotilla there is also a certain number of floating batteries and gunboats.

SWEDEN.

The Swedish coast is divided into departments, with headquarters in the naval ports, which are under the command of Admirals, who are responsible for the coast defence of their own departments.

Each department is divided into captaincies or districts, governed by Naval Officers of the reserve, who have command of the district coastguard companies and of the boatmen (or ferrymen) militia.

The service of lighthouses, semaphores, pilotage, and the ports, the hydrographical service, and the nautical schools are under the control of the Military Marine.

For service on shore, the Navy disposes, besides Naval Officers, of a cadre of permanent reserve, which is equivalent to that of sedentary Officers in other navies, and is similarly recruited. The Officers of this category are employed specially as heads of the Captaincies, Commandants of Coast Militia, Professors in the Naval Schools, &c. There is, in addition, during war time, a cadre of 2nd Reserve, in which Officers of the Mercantile Marine who have passed an examination as to their fitness, after having gone through a special course, can be enrolled as subalterns.

There is also organized, by means of the Marine Conscription, a Coastguard Militia, which includes all the sailors, fishermen, stokers, engineers, and inhabitants of the ports. This Militia is commanded by Officers of the Permanent Reserve.

Besides this, there is a Militia, peculiar to Sweden, which is maintained at the expense of land and house proprietors as a war and customs tax. The portion of this Militia which is assigned to the Navy goes under the name of Boatmen (or Ferrymen) Militia. A part of it is permanently under arms, and a part is only called out during war time, and for periodical drill. It is formed into companies, distributed among the districts, and commanded by Officers of the Permanent Naval Reserve.

The Navy can also, for land service, dispose of a regiment of Marine Infantry.

NORWAY.

In Norway, the coast defence, even in respect to the sea fortifications, is entrusted to the Navy, which, in case of need, is assisted by the Army.

The coast is divided into districts, governed by Naval Officers, who look after the coast surveillance of their zones, the recruiting of the levies, and the primary instruction of the recruits, and who also command the Coastguard Militia. Those belonging to the naval levy serve three years in the active Navy, followed by four years in the district naval Militia, and by three more years in the Coastguard Reserve.

The district Militia and the Coastguard Reserve are under the general surveillance of an Admiral or senior Naval Officer, and are periodically exercised near the commands of their respective districts.

A permanent corps of torpedo-men is organized for the submarine defence.

There is a permanent Committee on submarine weapons, and a permanent Committee on gunnery and coast fortifications.

The service of semaphores, lighthouses, and pilotage is connected with the Navy, and is directed by old Naval Officers.

UNITED STATES.

In the United States the question of coast defence is under consideration, and would already have been long ago settled were it not for the opposition offered by Congress to military expenses; this opposition has reduced the States to a somewhat second-rate condition in regard to defence.

Under actual conditions there can be used for the purpose of coast defence, just as in England, Russia, France, and Spain, a flotilla of coastguard customs, which is organized in a military manner, and which has already rendered good service in previous wars. Its *personnel* is also charged with looking after the lifeboat stations.

The service of lighthouses is in the hands of Naval Officers.

The semaphore service is organized on a vast scale and with great care by Engineers from the Army, and with its own *personnel*.

In case war should break out the Navy may, for the purposes of local defence, count upon an active list far beyond the requirements of the Fleet, and upon an ample reserve list, just as in England.

In the same manner as in England, the coast works and guns and the fixed submarine defences are entrusted to the Army.

RUSSIAN INFANTRY TACTICS.

By Captain C. A. COURT, Rifle Brigade.

THE INFLUENCE OF SOUVOROV.

If anyone were to take the trouble to collect the drill-books of Europe, to tabulate their information and collate all their interminable recommendations, a most striking similarity in all these polyglot regulations would, in all probability, appear as the distinguishing feature of the task when accomplished.

But it is nevertheless true that each Army of each State holds to its own particular and favoured form of development, in defiance of every strait-waistcoat constructed to crib, cabin, and confine its individuality, and, therefore, if we only carry an inquiry as far as the drill-books, we get no further advanced in penetrating the military tendencies of the infantry of a foreign army than a besieger who has only invested a fortress without having got even so far as the first parallel. And this fact is particularly true as regards Russia.

If anyone glances at the chapter on Tactics in that most admirable statistical work, "The Armed Strength of Russia," he will be struck with the similarity between what is laid down for the regulation tactics of the Tsar's legions, and what is the rule in other States. But regulations on all subjects are merely the dry bones of the military body, whose flesh and blood, breath and sinews, are derived from sources often insufficiently considered by the scientific Officers who draw up so elaborately these inanimate regulations.

Historical precedent and carefully fostered traditions have always been the main cause of the existence of a national school of tactics, and one cannot too soon and too unmistakably affirm that such a school exists in Russia in more elaborate perfection and in more active propaganda than in any other military State.

By groping about in the darkness of drill regulations one might search in vain for the password of the school, and, therefore, in order to gain a clear insight into the real tendencies of Russian infantry tactics, it is necessary to discuss the origin, rise, development, and present condition of opinion regarding this most important question.

If the secondary subjects of cavalry tactics and raids have more attraction from the brilliancy of their surroundings: if the duties of that other auxiliary, the artillery, provoke more warmth of arguments, the drill and training of infantry must ever remain the prime factor in the war efficiency of an Army and a State. "The Army—that is the infantry," says Prince Hohenlohe, with a sublime contempt for the prejudices and pretensions of his own arm in Germany: "The infantry is the Army, the Nation in Arms," says von der Goltz and it is mainly on the worth and training of this "queen of battles" that one can base accurate conclusions upon the efficiency of an army in the field.

In Russian wars it has always been the infantry that has given and sustained the main shock of battle, nor is it necessary to sing the praises of an arm that, to a certain extent, that is to say, so far as its qualities of endurance, marching, patience, and solidity are concerned, is appraised at its right worth both by its friends and its enemies.

The founder of the Russian school of infantry tactics is none other than the immortal Souvorov, a man whose labours, like those of many another genius, were only thoroughly appreciated and acknowledged long after his death. It is true that Souvorov commanded great armies and gave much attention to all arms and branches of the Service, not excepting the Cossacks, whose value to the Russian Army in the field he fully appreciated. But, like many other great leaders, he gave most importance to the "backbone" of the Army, and the greater part of his sayings and doings, handed down to the present time, have reference to the infantry. It is with reference to the subject matter of this paper, therefore, that his influence upon Russian tactics can best be measured and discussed.

General Milutine, in his "Campaign of 1799," delineates with skill the military talents of the Russian leader.

"It is curious," he says, "that some people can only see in Souvorov's campaigns, resolution pushed to the bounds of rashness. The study of the Italian and Russian campaigns proves, on the contrary, that our great Captain knew how to weigh with care both his strategical dispositions and his orders of battle, that he always acted with prudence, and never neglected any measures dictated by necessity. Certainly Souvorov mocked pitilessly at all that passed in those days for the 'art of war,' such as demonstrations, turning movements, and manœuvres. It was for this cause that he passed for a half-savage soldier in Europe—as one who had simply a kind of instinct for war. Those who thus judged him did not know or would not believe that the great Russian Captain had sounded the depths of all military history, had extracted the best lessons from it, and had acquired more of the essence of his art than most of his colleagues—students of the old school, who were accustomed to consider demonstrations and manœuvres as the true end, or something near it. Souvorov protested, with all his strength, against this school of pedantry, and covered it with his most rigorous sarcasms, but at the same time he knew very well how to make use of demonstrations, turning movements, and manœuvres as auxiliary means to facilitate the success of his enterprises. He called Julius Cæsar, Charles XII, and Frederick of Prussia his masters and instructors in the art of war.

"If we compare him with other great leaders at different epochs, we must impartially admit that some of them may have been his superiors in strategic combinations, in the art of moving great armies and of leading them in battle—in a word, may have been more skilful in what is called to-day the mechanism of operations. But as regards insight into the human heart and the use of moral leverage, one may say boldly that Souvorov has had no equal in all time: one searches in vain for another who had an iron will equal to his, a more virile and indomitable resolution, and a more absolute and powerful influence over men."

It must be admitted that if we judge Souvorov by the light of the opinion of his contemporaries, we should only find in him an outer barbarian, favoured by luck, and, in a military sense, something in the nature of a land pirate. But, as Napoleon remarked of the Seven Years War, the Russians at this time "either did not write at all, or wrote without any regard to the truth," while of Souvorov's foreign contemporaries, the Turks, Poles, and French had suffered so many reverses at his hands, that they could scarcely be expected to give an unbiassed history of the career of this most remarkable man. It has remained for a remoter age to dispel the illusions formerly current about the Russian hero, and to paint the great soldier in his true colours.

Did Souvorov conquer only because circumstances favoured victory, or because he had been, like Carnot, the organizer of victory, and had taken his measures to compel success?

Were his peculiarities of speech, manners, and action caused by eccentricity

of character; were they the aberrations of a buffoon, or were they, on the contrary, due to a profound insight into Russian character and the motives which sway men's minds?

Were his campaigns and his conduct regulated by a sense of the importance of the political and physical difficulties to be encountered, or did he follow out a machine-like line of procedure, which never varied with the ever-varying factors in each military problem demanding solution?

Formerly all these questions were answered in a sense hostile to the reputation of the Russian leader, but history has granted at last to Souvorov those laurels denied him in his lifetime.

Born in Livonia, Souvorov was, by parentage, a Swede: in his early life his career was long unsettled, and, in consequence, when he determined to join the Army he was obliged to enter the ranks, first as private and then corporal in the Guards, in order to win the grade he coveted. The experience thus acquired ever served him in good stead; for, in the lower strata of society in which his fortune compelled him to move, he became acquainted with the national character, and was enabled to study deeply and at his leisure the peculiarities of those men he was destined so often and so brilliantly to lead to victory. He soon rose in the Service, and became remarked by that able woman, the Empress Catherine, to whose favour was mainly due that lustre which he shed on Russian arms, and to whose influence he always attributed the subsequent brilliancy of his career.

When Souvorov, receiving the Empress at Kremenchug, on her celebrated progress to the Crimea, was asked by his mistress, scattering her favours right and left, what recompense he required, he replied, that he wished that the 3 roubles owing for his lodging might be paid for him, a caustic sarcasm on the struggles for ribbons and orders carried on by the flatterers, courtiers, and lackeys who surrounded the Empress, and never wearied of their genuflexions and adulations.

Souvorov always appealed directly to the sense of his soldiers: when in front of the beleaguered Ismail, he spoke to them, in almost the same words as Napoleon to the Army of Italy in 1796: "My friends, provisions are very dear, and we are in want; those funny fellows behind the walls have plenty, let us go and take it from them." Not less characteristic is the laconic message, "Proud Ismail is at your feet," by which he made known to the Empress the success of that sanguinary assault.

The personal ascendancy of Souvorov, and his great influence over his men, were very remarkable: he was no hot-headed blunderer, and always weighed his actions by the extent and nature of the opposition he was likely to encounter. When he fought the Turks, with their badly-served guns and unstable infantry, he took his chief measures to destroy the hostile cavalry first and foremost, and in the attack always advanced in columns. If he sometimes assailed the more disciplined Polish Army with small numbers and an equal fury, we can trace even in such action the fitting adaptation of the means to the end: in the Polish ranks he found a less brilliant cavalry, but better served guns: the latter he attacked by skirmishers.

"*Il va dessus à la débâdée*," remarked a French spectator, irritated at the temerity with which contemporary rules of war were violated; but against the French Souvorov proved, in many a field, that he was able to comprehend and utilize all the artifices of the most "scientific" and approved schools.

When Catherine died, her favoured soldier retired from active life, and lost caste with the Tsar Paul and his fashionable courtiers. It was England that appreciated him at his true worth, and demanded, at the Russian Court, that this Cincinnatus should be recalled from his fields, and be placed in command of the armies of the Alliance in which Russia counted for so much.

"Suvorov," wrote the Tsar, with some grandeur of feeling to his subject, "Suvorov has need of neither triumphs nor laurels, but the country has need of Suvorov."

Dazzled by the great deeds of the man whom Clausewitz calls the "god of modern war," military historians have not generally granted to Suvorov's campaign in Italy in 1799 the credit it deserves. In the space of five months the wise combinations, sustained activity, and vigorous initiative of the commander accomplished the destruction of four French armies, and reconquered for the Allies a country which had been in possession of the French for the preceding four years. In this short space of five months Suvorov tumbled to the dust those conquests that had been achieved by the legendary blows of the great Corsican, and threw back discomfited those legions of France which both before and after were promenading all Europe as conquerors.

Military opinion had hitherto held Suvorov cheaply, and had described him as a conqueror of barbarians, whose star would flicker and grow pale when compared with the greater light of Western militarism. But those enemies whom he had now defeated belonged to the nation which accounted itself the first military Power in the world, and opinion hostile to Suvorov's fame, refusing to admit his talents, took refuge in a sullen silence.

As if by some extraordinary process of reasoning a General who by dint of will, character, and energy had succeeded in one sphere of military activity, would by his success be debarred from succeeding in another! As if a man who had enchaind victory to the Russian eagles must be circumscribed in the activity of his genius to certain fixed climates, countries, enemies, and positions. Curious reasoning, indeed, which Suvorov was not the first nor has been the last to magnificently disprove. War is, after all, of one universal essence, which is only modified according to the infinite variety of objects and circumstances. Soldiers of real genius have in all time proved themselves capable of succeeding, no matter how infinitely circumstances might change.

It is useless to discuss the political errors which detracted so much from the solid gain of this campaign, and threw Suvorov into Switzerland, disgusted with the follies of the pettifogging diplomacy of his time. Suvorov had not spared his Russians. Of the 40,000 men he brought to the Austrian alliance, only 12,000 remained to him to accomplish that march across Switzerland, which redounds to the eternal credit and glory of the Russian arms, and crowned with the last laurel wreath the energy and genius of this remarkable man.

One episode of that campaign is worthy of mention, since it throws a strong light upon the influence of the impetuous chief upon his soldiers, and explains the methods by which the brave old leader appealed to the hearts of those soldiers whose innate loyalty he understood so well. Worn out with fatigue, losses, exposure, and exhaustion, his army had almost mutinied, and had refused to march further, being surrounded by enemies, and apparently doomed to an ignominious capitulation. Suvorov ordered a general parade, and formed his men into a hollow square. In the centre a deep pit was dug, and Suvorov came forward. "My children," he said, "you refuse to follow me. So be it. I shall not survive this disgrace to the Russian arms, and I have called you here to be present at my funeral;" and stepping forward he was about to precipitate himself into the grave, when a shout of enthusiasm arose on all sides, and the men he had so often led to victory rushed forward, and raising him in their arms vowed they would follow him to victory or death. When he returned to the Russian capital, full of years and of honour, Suvorov found himself made the scapegoat of the miserable politics of the European Courts, and retiring once more died, if ever man did, of a broken heart.

For half-a-century he had fought his country's battles against all comers and in every description of country. He had been present at over a hundred actions, and had gained over sixty battles or assaults by his own leadership. He had gained the love and adoration of his men by mere force of will, while the simplicity of his living contrasted strangely with that of Potemkin and other contemporary Russian leaders, who lived surrounded by an Oriental luxury.

He appeared to the superstitious to be the special confidant of Providence, while by his iron rule of subordinates he made them comprehend that he was the sole judge of their actions and arbiter of their destinies. Living among his men and always without a guard he associated himself with all the joys and sorrows of his soldiers; during a long and brilliant career he never knew defeat. He hated luxury; his morning bath in winter often consisted of a roll in the snow; looking-glasses were his particular aversion, and he would constantly break them, exclaiming that they were shameful furniture for a soldier's room.

Souvorov set the example of discipline with the same quaintness that characterized all his actions. He caused himself to be ordered to sit down to dinner, rise, sleep, or get up. Sometimes he affected to be astonished at the command, and asked "By whose order?" "By order of Marshal Souvorov," the Aide-de-camp replied. "Ah! his orders must be obeyed," the General would answer.

When he gave the order "Forward against the Poles," each man in the ranks had to give a thrust with the bayonet; when the same order was given "against the Prussians," the soldiers had to thrust twice with the bayonet; when "against the French," this had to be done three times.

Many writers have scoffed at his cock-crowing, which took the place of *réveille*, but the origin of this curious custom has generally escaped notice. In the first Polish war a spy was discovered on his personal staff, and Souvorov was urged to have him arrested and shot; he determined, however, to make use of him first, and published an order to his troops that they were to march at cock-crow. The spy duly sent word of the order; at eight the previous evening, however, Souvorov ran round the camp crowing like a cock, and within a few hours routed the surprised enemy, sarcastically thanking the spy when he returned for his good services. Few great leaders have been better instructed than was this man, whom it pleased certain jealous military contemporaries to apostrophise as a "savage." He spoke Turkish, Polish, Italian, German, and French fluently, and could address his Austrian allies in a slang German which was familiar to them. Like Napoleon, he excelled in conversation; he could talk theology to priests, jurisprudence to a judge, and anatomy to a surgeon. He detested parvenus, who with their ridiculous pretensions and airs became the favourite mark for his ironical shafts. The Tsar Paul, for instance, had elevated his valet-de-chambre, a Turk of very low degree, to the rank of Count, and on one occasion was so deficient in tact as to send him on a mission to Souvorov. He was received with much state and ceremony, and then Souvorov surrounded by his Officers asked to what foreign potentate he was indebted to the honour of the mission of the stranger. When informed that the Count came from the Tsar, he feigned great doubt and surprise, and asked to have the name repeated. "Kutaijov—Count Kutaijov," replied the unblushing ex-valet. "Ah! yes, I remember," said Souvorov, and sent for a list of the nobility, scanned it carefully, and then appeared to be again troubled with doubts. "Perhaps your Excellency's patent of nobility is so old that it is not mentioned in the list," he hazarded, and so continued morally castigating the unfortunate emissary until he had blurted out the whole story of his lineage and former position. Then turning to his own valet Ivan, Souvorov bade

him remark to what honours he might always aspire by the faithful performance of the most menial office.

Souvorov hated and abhorred nothing more profoundly than being answered by "I can't" or "I don't know," and should any unfortunate subaltern reply with one of these proscribed phrases, he was sure to come in for a severe wiggling. Once he demanded of a young cavalry Lieutenant what a "retreat" meant. "I don't know," replied the young Officer. "You don't know," replied Souvorov, aghast at having the phrase flung back at him so unceremoniously. "I don't know," repeated the subaltern, "I have never heard the phrase in my regiment." "You don't know . . . you have never heard the phrase in your regiment?" then, after a moment, Souvorov saw he was beaten, and rode away, murmuring, "Good regiment, excellent regiment!" Where the Russian leader particularly excelled in his strategy was in the firm conviction he so strongly held and practised, that it is armies which gain successes and form the most important element in war, and not fortresses, magazines, or money bags, and that success depends upon energy and movement, and not on the occupation of positions; like the great Frederick, he considered that the defensive should never be the premeditated plan of campaign, and that the adoption of such a plan was a sure sign of the decadence of an Army and a State.

Souvorov's funeral was a lasting disgrace to the Tsar Paul and the Russian Court; he had been out of favour, and his corpse received no honours; all courtiers, flatterers, diplomatists, and ambassadors avoided the grave of the dead hero, with one exception. The British ambassador, to his lasting honour be it said, was the only official present when the body of the great chief who had carried the Russian eagles so victoriously from the banks of the Borysthènes to the sources of the Po was consigned to its last resting-place.

Such, briefly told, was the life of the man who was the founder of the modern school of infantry tactics in Russia, and without this brief sketch of his career, the following remarks on his writings and their later interpretations would be incomprehensible.¹ It is unnecessary to add that Russian annalists have gathered from Souvorov's campaigns, sieges, and battles a host of tales, maxims, and orders, but the spirit of his teaching can be learnt without entering into long and wearisome details: "Bayonet, bayonet, bayonet," said the old Marshal to General Chastelar, when interrogated on his plan of campaign in 1799. "As for reconnaissances," he wrote to the same Officer, "I will have none of them; it is only cowards who send out reconnaissances to warn the enemy; whoever wants to come to blows with the enemy will find him without all that. Columns, the bayonet, the cold steel, the attack, the charge, these are my reconnaissances, and especially one should not overburden oneself with vain manoeuvres, counter-marches, and so-called ruses of war, which are only good for poor academicians."

The essence of Souvorov's teaching will be found best expressed in what has been called his "catechism," namely, an order written in his usual familiar style after a Turkish campaign. Extracts from this order are occasionally given in works on infantry tactics published in Russia. In France and Germany the one catch phrase which occurs early in the order has been seized upon and made the motto of the Souvorovian school. This phrase is, "The ball's a fool, but the bayonet's a hero," and to the remembrance of this saying half the errors with regard to the tendency of Russian infantry tactics may be attributed. In particular certain French military papers are always quoting the saying, but before pressing this point, and explaining the com-

¹ An admirable Life of Souvorov by Colonel Spalding is now appearing in the "Illustrated Naval and Military Magazine."

mentaries on Souvorov's method by later writers, it is necessary to read the order referred to.

"Keep your bullet," it says, "for three days, and if you can't buy lead keep it all through the campaign. Fire seldom, but surely. Forward with the bayonet. The ball's a fool, but the bayonet's a hero. Strike the Turk with the bayonet, and then strike him again. Even when nearly dead he may still tumble you over with his sabre. If his sabre is near your neck, draw back a step and then advance. Run the first man through, and then the second; a hero will run through half a dozen men. Make sure that your bullet is in your musket. If three men attack you, run the first man through, shoot the second, and then run through the third. In the attack there is no time to reload. When you fire, aim at the body, and fire twenty rounds. To buy lead is to be economical of one's life. Lead costs little. We only fire when we are sure of hitting. We don't lose one round in thirty.

"If you see the quick-match is in the gun, dash up to it; the shot will pass over your head, and the guns are yours, the gunners too! Overturn them, pursue them, run them through. Give quarter to the rest. It is a crime to kill without reason. They are men like yourselves. Die for the honour of the Virgin Mary, for your mother, for all the Imperial Family. The Church prays for those who die. Honour and rewards are for those who survive. Do not offend peaceable inhabitants. The soldier is not a robber. If you take a camp, it is yours. If a fortress, it is all yours. At the capture of Ismail, the soldiers divided gold and silver by handfuls. But without orders never pillage.

"In the open there are three forms of attack: (1) Attack on a wing. This is the easiest. If the flank is covered by a wood it doesn't matter. You can't pass a river, but you can pass over every kind of entrenchment; (2) Attack on the centre. This is not advantageous except for cavalry. You must cut them in pieces, or they will crush you; (3) Attack from the rear. Very good against a small body one can turn; in the open field against regular troops vigorous charges are required.

"Against the Turks form squares. The French are light-headed people who don't think of God. If we ever have to fight them, we must attack them in columns.

"Attack of field entrenchments. The ditch is never deep, the parapet never high. Throw yourselves into the ditch, climb over the parapet. Work with the bayonet, run them through, break them, make prisoners. If cavalry be present, make sure of cutting it to pieces.

"In the assault of a fortress, break down the obstacles, run as fast as possible, jump over the palisades, throw your fagots into the ditch: fire! Cross the rampart, devour the enemy in rear, extend your line, place a guard on the powder magazine, open the gates for the cavalry to enter, turn the cannon against the enemy. Keep up a rapid and sustained fire into the streets. This is not the time to rush on the enemy. When the order is given to enter the town, kill the enemy in the streets, and let the cavalry sabre them. Don't enter the houses, attack the enemy in the open places where he is assembling. Form a strong picket here, and others at the gates of the magazines. When the enemy surrenders give him quarter. When the interior walls are occupied, off and pillage!

"There are three military qualities: (1) The *coup d'œil*. Learn how to lay out a camp. Learn to march and attack. Learn to pursue and beat the enemy; (2) *Rapidity*. Here Souvorov goes into details, so that his "children" may be as little fatigued as possible. "The enemy," he continues, "does not expect us; he believes us to be 100, 200, perhaps 300 verstes off. We all fall on him together like snow upon the head. His brain reels. Attack him on the spot with any troops to hand, with all that God sends us.

Cavalry begins the work at once. Cut and slash! Pierce and break them! Cut them in pieces! Don't give them a moment's peace! (3) *Energy*. One leg helps the other, one hand strengthens the other. By fire many are killed. The enemy has hands too, but he doesn't know the Russian bayonet. Form line at once. Attack with the cold steel. The cavalry arrives; commonly it makes the first attack, and the infantry follows. In general, the cavalry must attack like infantry except in marshy ground; then they must lead their horses by the bridle. The Cossacks will pass everywhere. When the battle is won, the cavalry pursues and sabres the enemy, and the infantry must not be left behind." Then follow some excellent sanitary rules.

"But," continues Souvorov, "there is a greater enemy than the hospital, the detestable 'I don't know.' Indecision, conjecture, lies, fraud, equivocation, false delicacy, and the absurdity of the 'I don't know,' are the source of a thousand ills. It is shameful to sputter or to mince one's words. A soldier must be healthy, brave, firm, decided, true, honourable. Pray to God! From Him come victories and miracles. God leads us! God is our General!

"For the 'I don't know' arrest for Officers. Instruction is light, want of instruction darkness. The work knows its master. If the peasant does not know how to dig, corn will not come. A wise man is worth three fools, and even three fools are little. Give us ten, and a brave lad will beat them all, topple them over, make them prisoners. In the last campaign, the enemy lost 75,000 men, perhaps not much under 100,000. He fought well, and with the courage of despair, and we did not lose 10,000 men. Children, you see the effect of military instruction! Gentlemen, what a triumph!"

Such was the nature of the instructions Souvorov issued, and more worldly wisdom underlies these curious phrases and ejaculations than his contemporaries were prepared to admit. Almost every phrase in this curious order might be taken as a maxim on which to found a military essay, and one can understand after reading it why the French never quote it at length.

With this order read, it will be understood that to attribute to Souvorov the idea of making brute force, represented by the bayonet, the sole means of gaining victories would be entirely to misinterpret the whole tradition his personality represents. What is most important to realize is that the bayonet, of which we heard so much in the Crimea, is in reality an emblem of that energy and rapidity which form two of the three great military qualities of Souvorov's catechism. When the teachings of the master's disciples are noticed, this fact will appear more vividly.

To impress his troops with the conviction that they were invincible at close quarters was to Souvorov the most certain way of hastening an attack, and of avoiding those hesitating tendencies, those long skirmishings which so often form the prelude to a total cessation of movement. No doubt, had Souvorov been a German pedant, and his soldiers highly-educated Pomeranians, he would have impressed upon them the "defensive-offensive" or the "pure offensive," or some other cant phrase by which the German military critic characterizes the different kinds of forward tactics. But as Souvorov was no pedant, and his men only illiterate Russians, he took particular pains to inculcate by homely phrases, and by expressions which appealed to the poorest intellect, that devouring activity and daring which consumed him, and the lessons he taught are in fact none other than the very best of the German recommendations clad in a more homely garb, and divested of all academical embroidery. It was the Souvorovian idea that conquered Central Asia for Russia: that undoubting, unhesitating, cheerful acceptance of events, that dashing valour regardless of numbers that places the deeds of the Army of Turkestan on a level with those of Yermak and the legendary heroes of Russian antiquity. It may be said that it was the Souvorovian idea that lost many assaults in the war in Bulgaria in 1877, and

this fact was proclaimed from the house-tops by the many anti-national writers who made their voices heard from the time of the failure of the first attack on Plevna, as well as by those caustic German critics who seldom lose a chance of sowing discouragement in the ranks of their possible antagonists.

But, as Souvorov himself wrote, "Instruction is light, want of instruction darkness;" if lessons are misread or misinterpreted, if the leading is bad, disasters must ensue no matter what nature of tactics are adopted.

"This is not the time to rush on the enemy," remarks Souvorov, when the outer line of rampart of a fortress is captured. If he could have lived to see the developments of military science in these later days, and have seen a Turkish army surrounding itself with ditch and parapet, vowing itself to a certain destruction, none the less thorough because it was slow, he would have repeated the same phrase, and would not have said that the time had arrived to "work with the bayonet." All depends on leadership; if this is wanting, superiority of numbers, perfection of armament, excellence of material are all useless.

It is a fact that before the war of 1877 the military instruction of the Russian infantry was at a low ebb; barrack accommodation was very deficient, the system of training was not on a level with the requirements of the situation, few opportunities existed for the assembly and manœuvring of all arms, the true comradeship of battle did not exist, a great number of Officers had not the training or intelligence demanded by the increasing importance of individual initiative.

After the discouragements and wranglings caused by the Russian disasters there was a time when it seemed almost probable that the anti-national school would prevail, that Souvorov's memory would be relegated to oblivion, that long-range fire, a glittering and useless cavalry, with instruction based upon a *réchauffée* of Franco-German regulations, would be foisted upon the Russian Army, and that the Tsar's legions would be nothing but a third-rate copy of the German pattern. But, after a brief interval, the national voice resumed its protestations, and, guided by a few men of talent, opinion began to accept once more the spirit of Souvorov's teaching, modified and transformed so as to be acceptable in all the varying conditions of the infantry fight. It is General Dragomirov who is mainly responsible for turning back the current of opinion into its former channels. It is true that Russia has many another able military writer: Generals Leer, Levitzki, Gourko, Kaulbars, Zedeler, Todleben, and many others; but Dragomirov, by the brilliancy of his writings, by the great common sense that pervades all his work, and the intensely Russian vein of his humour, by the masterly manner in which he has explained and developed Souvorov's teachings, appears to be not only the best of the Russian military writers, but a man unsurpassed in the difficult task of military criticism and explanation. "Ecrivain original," wrote of him the *Revue Militaire de l'Etranger*, "plein d'humeur, Slav renforcé, le Général Dragomirov est bien le digne disciple de celui qu'il a pris pour maître, 'l'illustre Souvorov,' le coryphée, le porte-parole de cette école nationale par excellence qui a toutes les sympathies de l'Armée Russe, parcequ'elle lui répond à ses aspirations les plus irrésistibles." Severely wounded at Shipka, Dragomirov, already notable as a man who combined in a happy manner the best habits of thought and of action, was on his return to active life placed in command of the Staff Academy, and has, by his influence upon military training and thought, done more for the Russian Army than any other man in history, excepting Peter, Souvorov, and Milutine.

That Souvorov is great, and that Dragomirov is his prophet, sums up the opinion of nine-tenths of thinking Russians, and it becomes of the greatest importance to know how this writer contrives to shape the teachings of his master into harmony with modern conditions of war.

It has been remarked that it is perfectly useless to attempt to gather information from Russian drill-books, which are conceived in the usual formal style, and only afford certain general indications, and give recommendations and examples that are the daily bread of every well-disciplined force.

But General Dragomirov, foreseeing that this levelling of all individuality and initiative would inevitably lower the Army to the same cumbersome machine which it has been reduced to at several periods of its history when guided by incapable hands, determined to do his utmost to foster habits of initiative in all ranks, and to this effect brought out his "Manual for the Preparation of Troops for Battle," a series of instructions well worthy of close attention.

It is unnecessary to say that the General has written much valuable work of every kind, but, like Souvorov, his main efforts have been directed to train and improve the infantry first and foremost, and if it is required to understand what are probably the true tendencies of the Russian infantry, the system he inculcates must be carefully considered, since it is a system warmly and fanatically adopted by the Army, showing how deeply the Souvorovian tradition has touched the hearts of Russian soldiers.

In these works it will appear more clearly how baseless is the generally accepted idea that Russian infantry tactics and training consist of undiluted cold steel, invigorating tonic though steel may be.

Before analyzing this valuable work it is necessary to notice a few of the salient points of the regulations for infantry tactics which Drygalski¹ and others have fully described, and to see how far they harmonize or contrast with the teachings of the national writers.

THE NORMAL ATTACK FORMATION.

Many essential changes took place in the Russian field exercises in 1869, 1874, and 1875, while lastly the higher committee on the organization and instruction of troops took the whole subject in hand again after the war, and elaborated an entirely new programme by the light of the experiences of that arduous campaign.

The regulations for the instruction of the company and battalion in extended order begin by noticing that the company is formed in 2 half companies, 4 sections, and 8 groups or squads (in peace), 16 in war (*vide* Fig. 1). If the battalion is drawn up in two lines, each of 2 companies, the closed part of the first line forms the company reserves or supports of the skirmishing line and the second line forms the battalion reserve. Formerly the firing line was split up into groups of 4 men, but these have been now suppressed, and the squad made the lowest unit, while it is laid down that the sections are to be kept united as long as possible. Two sections per company are usually extended for attack. When the chain is reinforced the supporting fraction arrives if possible on a flank, and at all events keeps grouped together under a single control. There is no attempt to make men in the firing line "close to a flank," perhaps the most absurd and pernicious of all practices. Patrols guard the flanks during an attack. Bugle sounds can only be ordered by the battalion chief, except the "charge" and the "prepare for cavalry." Whistles are used to give warning of an order or signal. The company chief has four intelligent men attached to his person as a guard and to carry orders.

Regarding the fire discipline of the chain, the regulations say that the rifle

¹ "*Die Neu-Russische Taktik*, 1880, Drygalski; *Russlands Wehrkraft*, 1887, E.S.; "*Tactics of the Russian Infantry*," Durop.

FIG. 1. A COMPANY IN LINE.

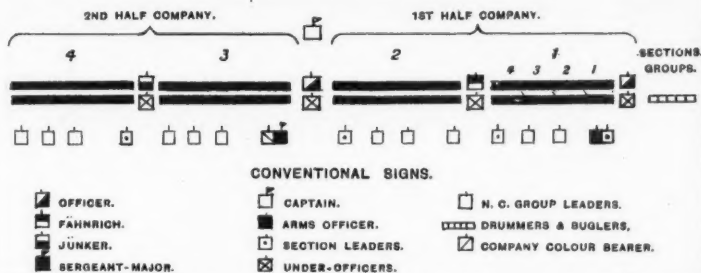
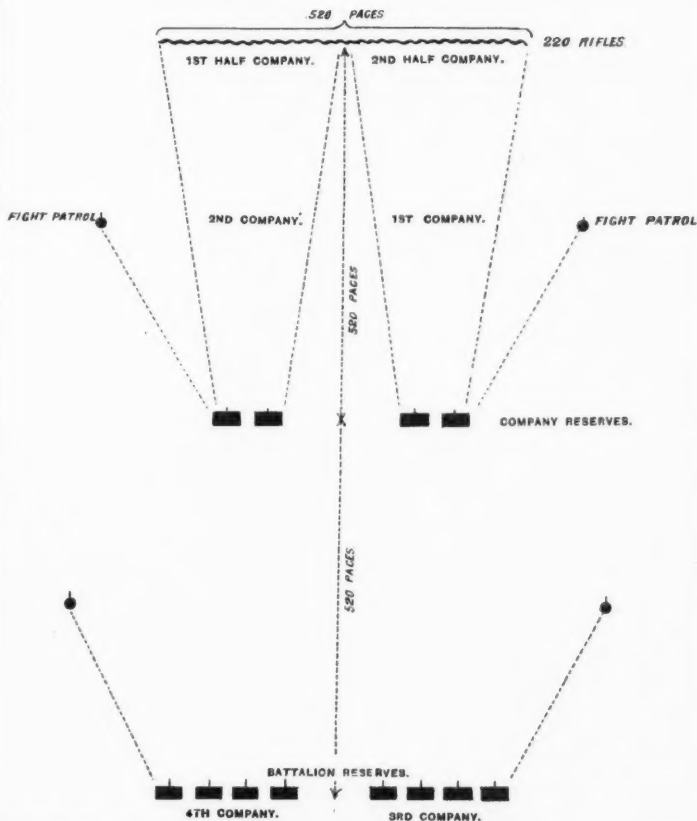


FIG. 2. BATTALION ATTACK FORMATION.



now used has great precision, and allows of rapid fire at great distances, and that it is indispensable to understand at what moment and under what circumstances it is convenient to use one or another of these properties. The precision of the arm is only valuable when the dimensions of the mark chosen are in proportion to the distance. Rapid loading is profited by in order to gain a certain definite result in a short space of time, as when a fresh body of troops appears unexpectedly just as a bayonet charge is about to take place. "Long-range firing must be resorted to with great prudence; it is only useful and advantageous when the marks admit of results equivalent to the number of rounds used: short-range fire alone has real accuracy." In the firing line individual or volley firing can be used, or a named number of rounds can be fired.

At 150 to 200 paces the chain begins rapid firing, and the company reserve draws near under cover of this, and in conjunction with the chain delivers the assault; if the reserve has been merged into the chain by reinforcing during the attack, it is for the battalion reserves to give the final impetus. The normal front of a battalion attacking is 520 paces.

Throughout all regulations and comments the advance of the reserves, by whatever name and in whatever formations, is looked upon with reason as one of the most difficult and important matters to bring to perfection. On this subject there may be read with interest an account of an experiment conducted by General Dragomirov a short time ago, in order to illustrate certain theories on this head.

One battalion on this occasion occupied an entrenchment, and was attacked by another; it was purely a frontal attack, made to bring out the various stages of the assault on a field work. Starting at a distance of 1,000 paces, the firing line of the attack was intended to cross as rapidly as possible the first 800 paces. The battalion reserves allowed the chain to gain 500 to 600 paces, and then advanced rapidly 400 to 500 paces. At 600 paces from the work they were only 50 paces in rear of the chain. The latter now crossed rapidly the distance between 600 and 200 paces, threw themselves down, and began a sharp fire; the reserves now came up, passed through the first line, and threw themselves into the ditch of the work; protected by the fire of the chain remaining in position, they took breath and threw themselves into the work, the chain dashing forward to participate in the final action. Without representing finality in any way, and in fact being open to criticism in at least two particulars, this experiment is not without interest.

For bodies larger than the battalion the Russian regulations wisely abstain from laying down normal forms of attack. When "many battalions" are on the ground it is recommended that they should be drawn up in one, two, or three lines, 400 to 500 paces apart.

THE SUPPLY OF AMMUNITION IN THE FIELD.

Few questions affect more vitally the efficiency of infantry in battle than the sound organization of the supply of ammunition. During the war of 1877 neither the regimental carts nor the flying parks could be depended on to replenish rapidly the ammunition carried by the men, and in consequence from 90 to 105 rounds were served out before an action, this too for men armed with a short ranging weapon and trained to reserve their fire. Skobelev was even in favour of a larger number, and declared that 130 rounds were necessary to keep up a fight. The question attracted much attention in Russia as elsewhere after the last war, and divided authorities into two opposing camps. The first, headed by the Skobelev, wished to make the men themselves carry the needed supply for action; the other, with General Zeddeler as chief exponent, was anxious to lighten the burden of the soldier

as much as possible, but to place an ample supply of ammunition within his reach by sound organization of transport, and by methodical distribution during a fight. The latter views prevailed, nor does there seem much doubt that the essential thing now is to organize the ammunition columns with care, so that what they contain, whether 20, 40, or 100 rounds a man, may be readily accessible and within reach of troops; this is the main point: the number of rounds carried by the wagons is almost a secondary consideration. In order then to make sure of success in a matter where formerly failure had been the rule, a number of exhaustive experiments were undertaken with a variety of carts and wagons proposed for regimental supply, while several methods proposed to meet the difficulties of distribution were tried in the field. Without entering into details of these trials, the general conclusion may be mentioned, namely, that two-wheeled carts form the best means of transport, and that these should be supplemented by pack animals in hilly country. As for the distribution, there was a general consensus of opinion that no system could prove satisfactory unless men were regularly trained to the work, and the duty established on a regular basis, like any other service. The instructions drawn up after these experiments lasted for some time, until they were modified by the regulations of June, 1886, about to be described.

In accordance with the recent organization of the regimental train, the supply of ammunition of an infantry regiment, in addition to the rounds carried by the men, amounts to 153,504 rounds, or 48 rounds per man for the 3,200 men in the regiment armed with rifles. These are contained by 553 zinc-lined cases, which are carried in 33 two-wheeled carts, namely, 16 company and 17 regimental carts. The regimental train forms two groups, of which the first marches immediately in rear of the fighting body, and the remainder at the tail of the column; 8 company carts march in the first group, and the rest with the regimental reserve.

The regulations of June, 1886, begin by noticing the formations assumed by the carts when troops leave the column of march. It is laid down that in this case the first group of carts should form up in one or two lines, 20 paces in rear of their troops.

When the troops pass from reserve to fighting formations the Officers commanding the several units give general instructions with regard to the positions and movements of the carts, in accordance with conditions of ground and the exigencies of the fight. In open ground the carts must not be more distant than the regimental reserve or third line of troops; if there is cover they may come up to the battalions in second line, or even in rear of the companies of the battalion reserve in first line. The arms Officer is required to keep his cart as much as possible out of fire while following out his instructions; he keeps his chief informed of his movements and position, and this Officer informs in turn his subordinates. The carts have to follow the ebb and flow of the fight, and the arms Officer is often called upon to take important decisions upon his sole responsibility. When the carts are distributed among the companies, a N.C.O. is in charge of each section of carts; the position of the carts is marked by a red flag in the day and a green lantern at night.

If ammunition cannot be brought up during an action from any cause, the troops may call upon their supports in rear for a fresh supply, and these in turn upon the reserves; rounds of killed and wounded are also collected. A body of troops requiring a fresh supply sends two or three men to the chief of the unit from which ammunition is demanded; half the supply of the latter is given over and men told off to carry it. If the supply is drawn from the carts it is carried up either in the zinc-lined cases or in bags, which form part of the equipment of the carts. Every request

for ammunition is to be immediately complied with, from whatever body of troops it may come. The carts are filled up from the second group of carts, at the head of which march the eight remaining company carts. This group is supposed to form up 500 paces in rear of the first group, but it will probably be seldom able to do so. Experience shows that once an ammunition column is separated from its fighting troops by being placed, as the Russian second group of company carts and regimental reserve are placed, at the tail of a column, the chances are against the happy discovery of this supply by the troops concerned at the crisis of the action; the train is looked upon as so much lumber by anxious combatants pressing on to the front; it gets pushed on one side, and as every road is covered with marching columns, the chances are decidedly against the reserve ammunition reaching the troops for whom it is intended.

MAGAZINE RIFLES.

In one way the question of ammunition affects Russia less vitally than her neighbours, for in the matter of repeating rifles Russia hangs back from following the lead set by Germany. Russia has weighty reasons for this determination, and one cannot but admit that her refusal to abandon a rifle of proved use on the battlefield for an untried arm notoriously defective in many technical details, is a decision to be treated with respect.

Since, on the other hand, the great military neighbour of Russia has definitely adopted the repeating rifle, known as the 1871-84 pattern, it becomes a matter of interest to inquire what this rifle is, what the tactical consequences of its adoption will be, and what reasons, other than purely financial ones, the Russians can adduce in support of their conservatism.

It may be said that the new German rifle¹ is essentially a cumbersome arm, as anyone can judge for himself by inspecting the pattern at the Royal United Service Institution, and, although no parts of the old rifle can be used in its manufacture, the new weapon is still essentially the 1871 rifle—neither the ballistic virtues nor the weight of the ammunition being changed: the arm being merely modified in a few details and provided with a magazine. The infantry field exercise book has been very slightly altered to suit the new arm, and the old regulation, namely, that “in all volleys, more importance must be attached to tranquillity and coolness than to rapidity of fire,” is maintained in all its force, being, in fact, interpolated after the new instructions on the use of the magazine, and so acting as a counterpoise to the new tendencies.

Fresh instructions for the training of the battalion in Germany codify all that can be said in favour of the repeater. “The magazine arm,” say these instructors, “gives the soldier a continual reserve of ammunition, and, thanks to this, he can be always ready to deliver his fire. This reserve can be always assured, provided that a discreet and judicious use be made of it, and that all occasions for renewing it are profited by. The firer must never forget that the new arm increases the need for the most absolute fire discipline, and that it is destined to produce not a superficially accelerated but a more efficacious fire. Officers and non-commissioned officers will, therefore, be careful that the magazine store is carefully husbanded, and only emptied at the decisive moment. At long and medium ranges fire round by round is enough. As a general principle the repeating action will only be employed at the very shortest distances. It is only in exceptional cases that it can be useful between 300 and 800 yards, to profit by the momentary apparition of good

¹ For a description and plate, see the “*Revue Militaire de l'Etranger*,” 15th March, 1887.

marks, which for tactical reasons it may be desired to cover with a violent fire."

Now, it is perfectly well known that the fundamental principle of German tactics is to seek out the decision by a vigorous offensive. The weakest portion of the Army begins the action at those medium ranges where fire is efficacious, and maintains the frontal or so-called demonstration-fight. Meanwhile the main body or reserves are collected in compact order, all irregularities of ground being profited by, so that these masses can approach closely the decisive and effective point with as little loss as possible.

Neither in principle nor in application has this general method been changed.

It may be admitted at once that, viewing the question of repeating rifles in the abstract, if an infantry makes up its mind that it gains a real superiority by adopting the magazine, it would be folly to deprive it of such a great moral leverage in action. But viewing the 1871-84 rifle, the adopted child of the German Army, it has been seen that it is only designed to utilize its fire for the final destructive lead-pumping process preceding the assault, and placing ourselves on the Russian standpoint, it is necessary to ask whether the expectations formed of the arm will be realized, and if so, whether they must perforce be decisive.

Some heretics there are who doubt this, even in Germany, for a writer in the *Militär Wochenblatt*¹ rather slightly remarks that "if the new arm gives a reserve of fire at the opportune moment it is far from guaranteeing this reserve in a sure fashion."

The adoption of what are euphemistically called *quick-loading* instead of *quick-firing* rifles in order to lay stress on a distinction with a difference, is, in reality, opposed to all the best traditions of German fire discipline, and it is not surprising that the opponents of the step are numerous, nor again that Russia stands unconvinced.

It is very right, no doubt, to say that the magazine is only to be used at the "opportune" or "decisive" moment, but when the ranks are filled with reservists who have lost the habit of fire discipline, the tendency will probably be to empty the magazine before the time, for under the present conditions of the infantry combat one cannot expect men to always judge for themselves when the "psychological moment" has arrived, nor can they always have at hand more intelligent leaders to inform them. The instinct of self-preservation seizes the most impressionable men, while the rest are not slow to make the best of occasions that will perpetually present themselves for making use of their new weapon. In short, what the Russians expect, what hostile German opinion expects, is that there will be a great waste of ammunition, and that the magazine will be emptied before the right moment. To preach peace education and to practise fire discipline is, no doubt, something, but will not this discipline pale before the irresistible emotions of the fight?

Admitting, however, that men armed with repeating rifles arrive within 300 yards of a position with magazines full, and begin a violent fire, will this be surely decisive? Hostile opinion says not; first, because the value of fire diminishes with its intensity; and next, because the reserves of the enemy are partly sheltered from this leaden hail, and remain more or less at disposal for the crisis. In fact, the superiority of numbers at the decisive point will always have to be acquired, as before, to dislodge a determined foe. Even on the defensive the new arm will not give an incontestable advantage: before Plevna the 64th Russian regiment captured two redoubts, which were held by Turks armed with Winchester repeating rifles, although

¹ 2nd "Beiheft," 1888, p. 36 *et seq.*

the advance was made from 2,000 paces in very vulnerable formations, and the attack itself took place from 500 paces.

The new armament of the German infantry will hardly produce a tactical revolution: its employment will increase the need for a strict fire discipline, and will oblige reserves to be husbanded more carefully for the decisive moment. But the original deployment and covering of the troops, the advance of the first troops and of the reserves, all the tactical methods in fact which were modified, not to say profoundly altered, by the introduction of the breech-loader, remain the same to-day as yesterday. The adoption of this rifle can only be regarded as a transitory measure until a good small calibre repeating rifle is invented.

With all these considerations held in view, the position which the Russians have taken up, even if it might not be expected from the general tendency of opinion in that country, can be readily understood. There remains then, apart from the question of solid reasoning, the question of sentiment, of feeling among soldiers that they are less well armed than their foes. If this feeling exists, it has been already noticed that it would be preferable to arm them with pitchforks rather than abandon the advantage conferred by the feeling of moral superiority. But the Russians quite understand this, and have tried to shape opinion to accord with their conservative decisions.

Thus, General von Roop, holding the important command of the Odessa Military District, addressed an order to his troops concerning the question of repeating rifles.

"Most of the armies of Europe," remarks the General, "have latterly begun to adopt the repeating rifle in order to increase the rapidity of fire of their infantry as much as possible. The news of this transformation, when propagated in the ranks of our Army, may induce men to think that the repeating arm is superior to the ordinary rifle. Consequently, I have made it my duty to have the question studied by specialists, and I now bring forward their conclusions for the information of the troops placed under my command.

"Comparisons made between the two systems have enabled us to conclude that the types of repeating rifles at present invented and partially adopted by foreign armies have very considerable defects. Loaded with all their cartridges, these weapons become much heavier than the ordinary rifle; the mechanism of the former is also more complicated and more easily disorganized than that of the latter. Passing from repeating fire to fire round by round, necessarily means loss of time. After prolonged fire with the magazine the rifle barrel grows hot, sometimes almost red-hot, and the vast amount of smoke prevents any exact aim being given to the fire. Lastly, the centre of gravity of the arm changes as the magazine is emptied, which does harm to the precision of the firing. There is every reason to seriously doubt whether the sole advantage of rapidity of fire makes up for all these inconveniences and defects. Is it not better to wait patiently for a probable perfection of the repeating rifle instead of condemning an arm that has shown its powers many a time in action?

"Even those who are prejudiced in favour of the new system recognize quite well that in an encounter between two adversaries, one being armed with any known pattern of the repeater, and the other with the ordinary rifle, victory will not actually depend upon the quality of the rifle in one system or the other, but rather upon the ability displayed in the use of the arm, upon superiority of instruction, and first and foremost, upon the worth of the troops. The order addressed to the Guard Corps, on the 28th August, 1877, before the last campaign, contained the following passage:—'It is neither by superiority of numbers nor of armament, nor by the power of defensive positions, that our valiant leaders in the past have rendered their names

immortal in their victories over the foe, but rather by their spirit of initiative, by their ability in directing movements, and by the valour of the soldiers.' These words have been justified on the battlefield. Let us, therefore, become impressed with the conviction that the time has not yet arrived to change the armament of our forces, and that while we retain the historic valour of our troops, we shall have nothing to fear with our magnificent Berdans, no matter what arm our enemies may have in their hands."

DRAGOMIROV'S MANUALS.

In his introduction to the Company Manual General Dragomirov clearly points out to what extent his writings can supplement the regulations. These latter, he says, together with instructions which have equal weight, only determine the march of instruction with regard to each separate object of military education, but the general fusion of this education and of these various elements, demanded in their practical application, is not and cannot be the aim of any regulation. He then demands that the spirit and not the letter of the Manual should be followed, goodwill and personal intelligence being preferable to plagiarism. The thing is worth the trouble, he adds, for the fate of thousands of people, victory or defeat, glory or dishonour, depend upon the more or less judicious manner in which the education of troops is practised. Success of instruction depends upon the character of the education of the soldier, that is to say, upon the extent to which he is penetrated by the conviction of his duty: it is education that dominates everything.

It is not practicable to give in full the instructions and suggestions contained in these Manuals; but their spirit can be comprehended by reading a certain number of extracts from those paragraphs which appear to disclose most clearly the system pursued and the means recommended for ensuring success.

EDUCATION.

1. "*The company chief is responsible that a good direction be given to the education of the men and all the cadres of his company:*" he has the duty of making sure that each man knows his work, and of taking measures to make good any deficiencies he may discover. An unfortunate habit, perpetuated from the time when the Officer was still 'your excellency' for the soldiers, places the company chiefs upon a misunderstood footing of equality with their subalterns, making it difficult for them to complete and verify the instruction of these young gentlemen. It is high time to give up these errors. True comradeship, worthy of men who respect themselves, is not exclusive of the obligations of the Service, on the contrary it presupposes them. He who has the authority and the duty to teach me the business on which my future depends, and who draws back from the task by a false feeling of delicacy, is no true comrade. Again, comradeship is so far from being incompatible with the exigencies of the Service that, in fact, it emanates directly from it. In reality it is familiarity that is inadmissible in the Service, because it is contrary to the interests of the Service."

2. "When it is a question of the private soldier we must remember before all else that during the fight it is not by virtue of the training we give him that his legs carry him on with more or less intrepidity, and that his arms work in a more or less sensible manner. Here everything depends in the first instance upon the way the heart beats and the head reasons. It is, therefore, head and heart we must bear in mind before all else when we think of making soldiers. The time when it was imagined that by addressing ourselves to legs and

¹ The italics are in all cases from the text.

arms one also addressed head and heart is past never to return. No doubt many people do not think so, but this is inevitable when old customs are dethroned by new ideas. But even these people become apostates little by little.

"Willingly or unwillingly rifled arms compel them day by day and by slow degrees to accept many ideas which appear to them revolting heresies before.

"It is incontestable that through legs and arms one can manage to drive a little something into the head, but to begin with this something is not enough for a man who is called on to give his life for his country, and in the second place very often we achieve the most unexpected results, directly opposed to those we have in view. It is, therefore, a great mistake in a company chief to imagine that by teaching his men bayonet work, musketry, evolutions, and use of ground, that he has done all that is necessary, and that the rest will come in the ordinary course. One may be ever so competent at bayonet practice and musketry without having any ideas of military duty. Seek, then, before all else to engraft in the soldier's heart the sense of military duty, develop in his head ideas of honour and honesty, strengthen and elevate his heart, and it is the rest that will come naturally."

3. "Our task has now become very difficult; success is only possible under the express conditions: (1) that the work is regulated conformably with the ends in view; (2) that a method is adopted capable of giving as solid and quick returns as possible."

"The first point demands (1) that a rationally elaborated plan shall guide all instruction, for if not something may be omitted or perhaps time may be given up to different branches of the instruction out of proportion to the relative importance of each; (2) that the company chief thoroughly understands the part of instruction which devolves upon him, and that which is the business of subaltern Officers, non-commissioned officers, and instructors."

"The programme is now regulated for all the army under official rules, but it is not waste of time to lay stress upon this point."

4. "It is known that the preparation of troops has two distinct branches, education and instruction. *It is the company chief who must undertake the task of confirming recruits in the first of these branches*, that is to say, in the obligations rather than the duties of execution. The ceremonial can be taught by instructors, the company chief verifying the work of his assistants."

5. "The method can be formulated in two words: *prefer ocular demonstration to verbal explanation in all cases where it is possible*. It is better to show once than explain twenty times."

6. "Never forget that you address common soldiers, and that it is necessary (1) never to give them more than one or two ideas at a time, and to require that they repeat at once what is told them; no discussions with the soldier; (2) avoid words only employed in books; (3) teach only what is indispensable; (5) seize every occasion for ocular demonstration and use as few words as possible."

8. "The recruit joins his regiment disposed to obedience, or what comes to the same thing—to execute orders received. For from his infancy he has obeyed the head of the family and, when a man, the representatives of authority who are in immediate contact with the peasant. This faculty has, therefore, only to be specialised."

9. "In order to carry out military duties we require *punctuality* and *promptitude* in the execution of orders, based upon a *boundless devotion*, and sustained by the *active working of the intelligence*. All these conditions are indispensable in war, since success in this depends upon the unanimous action of *masses* in accordance with the will of a *single individual*.

"We must not forget that our mission is to kill by getting killed. This is a point upon which we must never shut our eyes. To make war and kill without being killed is a chimera; to make war and get killed without killing is stupidity. We must then know how to kill while being ready to perish. The man who vows himself to death is terrible. Nothing will stop him from reaching his goal unless a foolish bullet mows him down on his way; but if one can kill a man one can't kill a whole company. In consequence the soldier must make up his mind not to fear death while learning the art of selling his skin dearly. For this devotion and intelligence are required; to aid the latter it is necessary to give the soldier as well as the Officer a well-reasoned and studied instruction in all that constitutes their speciality. Self-denial is strengthened in a soldier chiefly by education, while the development of intelligence in the sense of warlike use is mainly acquired by instruction.

"Instruction will contribute so much the more to confirm the results of education as the exigencies of this instruction are in harmony with the ends in view."

10. "It must not be thought that severe punishments can contribute to accelerate and perfect the soldier's education. Nothing of the kind. The best system of education is to be always inflexible and unchangeable in the demands made of the soldier from the first. Let him know that what is told him once has to be done always; that certain acts will infallibly produce certain punishments. In a word, let him see that his duties are the same yesterday, to-day, and to-morrow. Then he will train himself to the faithful execution of his duties, which will become for him mere routine, that is to say second nature."

The next question General Dragomirov discusses is that of the ordinary routine of service. The bases of this, he says, rest on four precepts: (1) Obey orders; (2) never absent yourself without leave; (3) if anything out of the way happens report to your immediate superior; (4) take care of your arms, body, and clothing. A soldier who thoroughly understands these precepts is a man on whom one can count.

The General then lays down the need for reciprocity in paying attention to marks of respect, and justly exclaims against the snobbishness of some Officers who fail to return salutes, showing thereby that they are less well brought up than their men, and giving a lamentable example of neglect of regulations. When, he adds, one does not execute one's obligations, one has no right of impressing this duty upon others. The General is very severe upon those who follow the letter instead of the spirit of regulations, and recounts the story of the attempted assassination of General Loris-Melikov, who himself seized the would-be malefactor, while the gendarme on duty stood by at attention in a rigid attitude with his hand to his cap. He says that it is the company chief alone who can inculcate the true sense of duty to his men; it is no use, he says, to confide this matter to the non-commissioned officers of the company; with the actual duration of colour service it is quite enough to expect the latter to carry out their own duties and supervise the way in which the rank and file carry out theirs. No doubt, he adds, there are exceptions, but we are not concerned with exceptions. By passing all the contingents through his hands the captain gets to know his men thoroughly and to be known by them, a condition of the utmost importance in transforming the company from a mere agglomeration of men to a compact organism whose head is the same company chief.

Turning next to guard duties General Dragomirov points out the enormous importance of this first step in the soldier's responsible service.

"The life and death of his fellow-beings are now left to the discernment of the sentry, without any guide at his elbow to direct him; to fulfil this most difficult and thorny task all the best qualities are required. Every

recruit without exception must be thoroughly trained to this duty, for if it is confided at a critical moment to a man who has not been thoroughly trained the greatest misfortunes may result."

The General then advises that men should be posted, and that after their duties have been fully explained to them efforts should be made to get the countersign from them, to get them to give up their rifles, &c. If they fail to fall into the trap they should be given some money to show appreciation of their cleverness; if they accept this they should be told that it is shameful to accept money when on sentry. Again, men must refuse to be relieved except by the corporal who has placed them, and attempts must be made to entrap them again in this matter. Once a man has been taken in and given a good talking to, says the General, he will not err again.

INDIVIDUAL INSTRUCTION.

The General strongly advises musketry and bayonet practice before manual exercises. He recommends the well-known parapets, palisades, and ditches of the German out-door gymnastic drill, and strongly urges the necessity for plenty of gymnastics in general. Not less does he press the importance of route-marches in full marching order, and says that infantry can call itself a good marching body when it can cover stages of 30 kilometres for several days in succession, and only leave a few stragglers. To effect this, a rigorous progression in the increase of weight and distance is essential.

20. "Bayonet practice. To accustom men to make skilful use of the bayonet in battle the following must be frequently practised: In exercises against dummy figures great attention must be paid to the vigour and precision of the thrusts; that is to say, that less attention must be paid to perfection of parade movements and more to vigorous blows well aimed at the part of the dummy designated. Bayonet dummies are cheaply made with straw and wool, &c. Men must thrust with the bayonet as they run without lessening the least in the world their pace at the moment they thrust. This is the only means of accustoming them to withdraw the bayonet promptly after a blow. As a good training for the eye it is useful to teach men to run through dummies which are waved about at the end of a rope."

"In bayonet practice of two men together the chief thing is to develop in the two adversaries *the ardour and animation of the fight to their utmost limit*, and consequently not attach too much importance to the pedantic execution of the rule 'Parry first and then thrust'! This rule is chiefly good for men of calm temperament and who possess great skill in the art which cannot be attained in the instruction of the mass. Ordinary people will only succeed in giving sound blows in battle if they have been well taught not to pay much attention to their own defence. To give the right sort of thrust the weapon must be wielded with both hands, and must never be quite let go with the left hand when a blow is delivered with the right. At the same time it must be explained to the men that the artifices employed by men in practice pitted one against another are out of place on the battlefield in the shock of masses where a straightforward thrust in good earnest and with both hands is what we want. This is why it is a useful practice to draw up men in single rank opposite a row of dummies, to make them charge at a good fast run from the distance the assault is usually given, and then to thrust straight to their front up to the hilt. There are no methodical rules to be positively prescribed for this apprenticeship. To introduce rules for this kind of business would be to prove that the whole essence of the affair is misunderstood. But special attention must be paid to the *prompt withdrawal of the bayonet immediately the blow is delivered*."

The General next urges the necessity of acquiring a firm, free step and bearing before any dressing is sought for, and in connection with this mentions a saying of Souvorov's at a time when the pace was reduced from an archine to three-quarters. "The pace has been reduced by a quarter, so that when we march against the enemy we only do our 30 verstes in place of 40."

In the next two paragraphs we find the whole essence of the fire discipline inculcated by the national school, and the ideas formulated on this head are worth attention.

23. "Ever since breech-loaders were adopted it has become indispensable for all people to become convinced of the truth of the axiom 'Fire slowly but surely.' Starting from this one should make it the rule in peace to restrict as much as possible those practices most capable of developing in the soldier the habit of aiming carelessly and firing hastily, allowing him to gain the belief that he has the right of freely disposing of his fire, not only in open order, but even in close order too. Consequently it is necessary (1) to avoid blank firing, which aids in agitating the soldier, and makes him aim carelessly and fire hastily. (2.) To keep the control of fire in the hands of the proper chiefs, not only in close order, but also partially in open order. The whole march of instruction should contribute to engraft in the soldier the conviction that only cowards are in a hurry to fire, and that a soldier who respects himself should always wait for the word of command. A man who fires without word of command in close order is guilty of the crime of disobedience to his superior. In open order the chiefs, whether Officers, non-commissioned officers, or chosen men, do not always determine the moment for firing, *but they should guide the skirmishers in their selection of a mark, and order them to cease fire whenever the advantages that may be gained by fire will not be likely to correspond to the probable consumption of ammunition.*"

24. "Husband your cartridges. Always fire by volleys in closed ranks, and the same for choice in open order, especially if the distance is over 800 paces. Volleys are better than individual fire. Fire remains under control; the smoke does not interfere with the aim, the point of impact of the bullets can be noticed. Firing must take place tranquilly, against a clearly defined mark, and be executed with the greatest possible care. Rapid firing obtained at the expense of care given to aiming increases the expenditure of ammunition, and diminishes the chances of hitting.

"Chiefs of squads, instead of watching men to see that the sights are altered, that firing is orderly, that all words of command are carried out, and that warnings are paid attention to, are often seized with an unreasoning agitation, and cause a lot of powder to be wasted at absurd marks. These must be taught to do their duty quietly and sensibly, and without shouting. It is the first shots that produce the greatest impression upon the adversary. This is the reason that they should be well aimed, for badly-aimed shots only embolden a foe, since they teach him to believe that our fire is worth little."

25. "At all distances it is best to aim at the foot of the object; a ricochet is worth more than a shot which flies overhead. *On the field of battle the following must be carefully avoided:* (1.) Volley firing with several sights, for the dispersion of the bullets is quite enough even when all men take the same elevation. (2.) Firing with a named number of rounds as well as rapid fire, since both one and the other easily degenerate into irregular firing, which is very difficult to stop."

In some further remarks upon this question, General Dragomirov, after showing that it is not worth the trouble to fire at single men over 300 paces, states that volley firing at long distances will be rare, and generally speaking, that an efficacious or well-aimed fire cannot be rapid. Again, he says, fire must not be rapid, because it is only by controlling the firing that men can be kept in hand, and be prevented from exciting themselves to such a state

of fever that the shooting becomes wild. This, he adds, is why we always come back to the aphorism "Fire slowly but surely," and it is a mistake to call our present weapon a quick-firing arm, it is only a *quick-loading* arm.

"The experience of the last war inspired a number of soldiers with the conviction that volley firing and the raining of lead upon certain zones might be of real advantage even at the longest distances. The Turks fired without taking aim: there was practically no limit to their supply of ammunition, since they rarely attacked, and did nothing but pass their time in positions prepared beforehand, where boxes of cartridges were freely distributed. If we also remember the absence of instruction in musketry of the majority, this will be enough to make it clear that their fire was nothing more than a disorderly wasting of ammunition, and that it would be a queer notion to make this practice an object of instruction when it comes so naturally to any army formed of semi-trained levies. But a disciplined and instructed army must not have recourse to this, for in such an army the soldier should be imbued with the conviction that efficiency of fire depends upon the accuracy, and not upon the rate of firing, and that a round fired on the off chance at a long distance is a round lost for close quarters. It is true that closed bodies may now and again appear, to be saluted with distant volleys, but this fire is rather the business of the artillery. If, again, the enemy's reserve show up 1,500 to 2,000 paces distant, it means that his first line is face to face with us. Our infantry in the fighting line will have enough to do without troubling itself about the reserves. Long distance lead pumping is rational if the supply of ammunition is quite inexhaustible, and if the army making use of it is so ignorant that no other kind of fire can be employed. But as for seeing in this kind of shooting a new opening for fire tactics and infantry, such an idea is altogether absurd and inadmissible."

INSTRUCTION OF THE COMPANY.

"The well-reasoned preparation of the company forms the base of all the military education of the infantry. If the companies are good the battalion will be good too. The programme of instruction of the company is determined by the division of the fight into two periods, that of fire or preparation, and that of the bayonet or decision; the latter shows which of the two adversaries is worthy of victory. Company instruction thus falls into three branches—

"(1.) Application of marches and formations in all kinds of ground without firing.

"(2.) The same with ball cartridge.

"(3.) Preparation of the company for the bayonet attack."

28. "*All these exercises must be conducted in a manner to impress upon the soldier and the chief the knowledge of what each will have to do in battle, and at the same time to increase the self-confidence of all, so that none of the vicissitudes of the fight may surprise either soldier or chief, or take them at a disadvantage.*"

Quoting Souvorov's example, General Dragomirov advises Officers to have frequent conversations with their men on subjects connected with their profession. "Gentlemen," he says, "do not refuse to enter into explanations with your men about your common duties in battle. Great actions and the art of getting out of the most difficult situations are only possible for him who knows the soldier, and whom on his side the soldier knows and understands."

General Dragomirov next shows at length how to apply the regulations for company drill. In this he takes for his argument Napoleon's advice, that one should constantly think what one would do if the enemy were to appear suddenly in front, rear, or on the flanks, and with any arm of the Service.

Taking a number of examples, the General then shows how to *apply the regulations*. These examples need not be discussed; they are intended to train Officers and men to meet calmly the most critical dangers, and to overcome the most unexpected difficulties.

Among various pieces of advice it may be mentioned that against cavalry the General recommends formations which bring as many rifles as possible to bear, while only exposing immediately to the hostile blow the smallest possible number of men. Cavalry will always, he believes, pass through the intervals, if intervals are left for them. He remarks upon the great importance of reducing to a minimum the time of all formations against cavalry, and of getting men in hand, perfectly calm and steady before the blow falls, *even at the sacrifice of the volley.*

TACTICAL EXERCISES.

The General recommends that the time wasted on the march to and from manœuvres, musketry, &c., should be better employed.

In his observations on manœuvring within the zone of fire, he has much to say of interest. "It is necessary," he says, "to show *where one is going, and why one is going*, and only secondly *when, and in what order one is going*. The two first objects, directive and objective, can only be expressed by means of orders: these must be clear, concise, and energetic. It is a great art to give these orders, and only acquired by long practice. Gentlemen, give your whole attention to this art, and do not fall back on drum or bugle; neither of these are possible on the field of battle."

67. "*When the enemy is in one's front it is necessary, before everything else, and always, to think how one can take up the position most calculated to do him harm. It is only after realizing this condition that one may think of covering oneself.*"

68. "Starting from this, a rifleman, taken singly, is well posted (1) if between himself and the enemy there is no object concealing the position of the latter; (2) if there is a rest for the rifle; and (3) if there is more or less protection at the same time."

In discussing the duties of the firing line the General shows that its chief duties are to learn: (1) how to outflank the enemy's line; (2) how to reinforce part or all its line; (3) how to resist a cavalry attack; and (4) how to make the final assault.

What the bullet cannot do, he says, the bayonet will; and this is the reason why, when once an attack has been launched, it must be carried through to the end, that is to say to blood. No enemy lives who can stand firm in front of soldiers with a taste for the bayonet, and able to use it. Only we must not hammer the enemy in a disorderly and dispersed mob, but by masses; thrust with a will, and disengage comrades in danger.

Short rushes of the company supports are condemned. In open ground it is recommended to get what cover is available, and then advance by 300 to 400 paces at a time. The General considers that the firing line has a light job to advance compared with the march of the closed bodies in rear.

One of the peculiarities of the training of Russian infantry and cavalry is what we may call their traversing attacks—a system of field exercise only partially applied to the German and Austrian cavalry, but unknown elsewhere. The principle is that all troops attacking should be made to come to close quarters, whether infantry against infantry, cavalry against cavalry, or infantry against cavalry, and by passing through each other's ranks, become accustomed to throw themselves vigorously upon a hostile body of troops. In this action the pace has to be rapid when the moment for closing arrives; as a rule, when this is practised in the company, half awaits the attack, the

other half rapidly advances to the attack up to within 250 or 300 paces ; here a halt is made to fire volleys, and the advance is continued ; at about 100 paces the drums begin to beat the charge, at 50 the assailants charge bayonets, and at 20 or 30 raise a shout, and throw themselves through the intervals of their opponent's ranks ; at the moment of contact arms are sloped. The defenders are advised to send a few volleys when the enemy is 300 paces off, and then to await the moment when he is 50 paces off, "so that all may pass with calm." Order has to be immediately re-established. When cavalry attacks infantry, and *vice versa*, it is believed that good is done by accustoming men to the impression produced by a line of horsemen, while it teaches the horses to affront infantry fire without fear.

General Dragomirov says that no peace practice is better than these forms of exercise to complete the education of the infantry in the matter of calmness, firmness, intrepidity, and determination. When opposed to cavalry the files are extended at 5 paces interval. Often the lines are halted in front of one another. The men "make much of the horses," and the drums and bugles sound vigorously, or the manual exercise is gone through. In this advance, as in all advances, men are told to march, not "by their right, left, or centre," but "by the foremost men." It is further believed that this procedure trains infantry to estimate the moment when volleys against cavalry should be begun, and the latter when they should begin the charge. Accidents no doubt occasionally may happen, says the General, but they will be very rare, and troops trained in this way will never be taken at a disadvantage in the fight. He quotes the fight at Lecco, in 1799, where French cavalry penetrated a Russian battalion formed in column, but never came out again ; this is what we get by our traversing attacks, he says.

In the preparation of targets for field firing it is recommended to distribute the dummies at one spot wide apart, and at another close together, in order to train the subordinate leaders to point at the most favourable targets ; trial shots, to determine the distance, are also advised. Field firing confirms men in the habit of seeking a support for their rifle, a matter that must be left to their personal sagacity : as for single men taking cover, this is of less importance than that they should get into a position where they can use their arm with effect.

In the attack during field firing, marks representing cavalry are placed on the flanks or in other positions, hidden at the beginning from the attack, and squads are trained to run together and fire rapidly at these as they disclose themselves : again, turning movements of the defenders are shown by lines of dummies, concealed up to a late moment, and the assailants are forced to throw forward fresh troops to oppose these. "This," says Dragomirov, "is a useful means for training troops to oppose readily movements of this nature in the field."

There is nothing very novel in this exercise, since the system was first tried at Spandau many years ago, and has been generally adopted in Germany ; but it is a proof of the careful attention bestowed upon infantry training in Russia.

When the company is being trained for defensive action, it is particularly laid down that it must be carefully impressed on all that *one must defend oneself by attacking*. A series of sound practical rules follows, and it is particularly urged that superiors must not usurp the functions of their subordinates, but must rectify errors through the responsible subordinates. More particularly it is recommended that the flanks must be carefully guarded, since it is the surprise rather than the fact of a flank attack that is dangerous : it is the bayonet and not the relative position of the two adversaries that decides the victory.

126. "The most efficient stimulant to render Officers clear headed is to

read with intelligence what has been written by men who have had a finger in the pie (Souvorov, Bugeaud). For Officers devoted to their profession, this advice, I trust, will not be lost."

INSTRUCTION OF THE BATTALION.

In his Battalion Manual the General lays stress, at the outset, upon his opinion that regulations are merely a collection of typical and fundamental formations only, and that it is allowable and even obligatory to modify them in application, according to the *ground*, the *occasion*, and the *enemy*.

After discussing the duties of the battalion chief, which, he says, are those rather of a controller than a Commander, the General points out that the *role* of the company in the battalion is like that of a rifleman in a squad: in close order the independence disappears, when extended, all is left to the individual initiative; but comrades must, in all cases, be closely supported, whether they belong to the same or other battalions.

16. "The *role* of the battalion, and the companies in action, is explained as follows:—(1.) The battalion chief gives notice of the aim to which all efforts must be directed: each company chief must give his aid to the general success by all possible means, without being distracted by partial and seductive secondary objects. (2.) The battalion chief fixes the general order of battle of his command, that is to say, number of companies in the firing line and reserve: this order is obligatory, and every temporary infraction of this order must cease as soon as a change of circumstances allows."

Remark.—"It was noticed in the last war that the companies in second line, or battalion reserves, joined the firing line without orders. This must never be allowed, for in this way men get out of hand, the direction of the fight becomes impossible, and success depends on chance. This premature intrusion upon the fighting line is explained by the instinct which impels men to give up inaction, so difficult to bear under fire; but true discipline consists precisely in not allowing men to be carried away by their instincts, and in obliging them to act as success demands and as they are ordered. This premature advance into the fighting line is like the action of a nervous man, who fires away a round without a moment's thought whether it has the least chance of hitting anything, or of a chief deficient in coolness, who launches his troops to an assault without noticing that the distance from the objective is still too great."

16. "If the battalion chief gives the signal or order to attack, *every man of the battalion must march to the assault*, unless, of course, the chief orders a fraction to halt in a favourable position to aid success by fire. This being settled: (1) the company chief is fully master of the form of attack for his individual company; (2) he must not trouble his head to preserve any regulation distance between the front line and the reserve; if he sees that the losses will be less by closing up with, or even joining, the advanced line, *he may and must allow this advance*. But he must never stay behind, even to spare his company, since he must always be able to support the advance before the enemy's reserves can attack it; it is this condition that determines the maximum distance that the reserve can remain in rear. (3) The company chief must not attempt to seek for a pedantic alignment with the companies in second line with him; (4) he is free to aid the fighting line as circumstances demand, as well as comrades right and left, and whether by fire or bayonet."

In changes of front the General exclaims against the "half right," and so forth, and says that all changes of front should take place with respect to some visible object; in the field, he says, direction does not depend upon the angle of the change of front; but the latter does depend on the direction.

Examples then follow as for the company, to impress upon all the conviction that they must be ready to confront every emergency, however different from anything laid down by the regulations; in all cases it is urged that the object of the movement must be briefly pointed out to the men, since many disasters occur in action from the ignorance of subordinates of the object in view. The majority of General Dragomirov's examples demand some formation in *échelon*, of which the writer seems fond.

The following paragraph shows clearly in what manner the General and his school regard the question of the attack.

28. "The company has become a tactical unit, which must, in certain cases only, be lost to view in the mass of the larger battalion unit. This evolution is chiefly due to the perfection of firearms. The increased accuracy and range have made it essential to find less vulnerable formations. It is also this fact which has equally modified the *role* of the chain in the contemporary attack formation. Formerly the chief duty of the chain, both in attack and defence, was to cover the battalion up to the moment of the shock; but now the capital duty of the defenders is to maintain the position of their firing line; consequently, in the first part of the action all the business has to be done by the chain, and the battalion is nothing more than a support to the chain. The necessity of supporting the chain on one hand, and on the other of avoiding losses, has led to the battalion being broken up, so as to form sections, in each of which the chain has an immediate support or a reserve, while companies are enabled to individually utilize cover, which, from its dimensions, would be lost to the battalion. This disposition is all the easier, since thanks to the improvement in arms, the companies continue to mutually assist one another by their fire, thus preserving their union, in spite of the comparatively considerable distances that may separate them."

The General then enumerates all the many advantages of the company-formation, and finally shows how, by holding a long slender line, a weak force may create the required impression of great strength. "But," he says, "the enemy may play us the same game, and how shall we know the truth? There is only one way—the bayonet."

"Fire tells us little; ten battalions can skirmish with one for whole hours without disclosing anything, while the bayonet will disclose the truth in a moment. Before it fall in a moment all shams. Of course one may run one's head against superior force, and receive a check, but, at all events, in this case, one knows what is in one's front, and if one has not been able to work for oneself, this will assist one's comrades, and, consequently, the object is gained. Between two situations, that of allowing the enemy to show one man for ten, and that of seizing the truth, even at the price of a drubbing, it is the latter that is always the most honourable and the most useful. One cannot always win, and there is no dishonour in paying the piper when one gets hammered by superior forces, provided that one has cleared up the situation for the detachment of which the battalion forms part. I repeat it again, one must always remember in war that certain information can only be gained for the most part by taking an occasional thrashing."

In defensive positions Russian troops are taught to fire slowly and accurately; to give a last volley when the assailant reaches 60 paces distance, and then attack him with the bayonet.

47. "Everybody knows that infantry effectives in peace are much below the number in war; the difference between commanding a company of twenty-four files, and another of, say eighty, is very great. The same holds good for the other subdivisions of the company."

"For this reason the battalion chief must cause a number of company manoeuvres to be executed with numbers representing the war footing."

The General advises that troops should be practised in advancing through

woods and undergrowth, and the greatest attention be paid to the general alignment; it is not a very subtle manœuvre, he says, but it is eminently useful, and he urges all Officers to have compasses, since these are very often the only means for keeping the right direction.

Among general recommendations may be mentioned one that occurs several times, namely, that as a rule, infantry near a battery—the latter meaning any number of guns united for a special purpose—have the duty of guarding the battery and of watching its unprotected flank. For this purpose a company is advised to take up the duty at once, if it appears necessary, without waiting to consult the battalion chief.

General Dragomirov is a great preacher of comradeship in the fight: all depends upon this in war, he says: with it nothing is impossible, without it even easy matters become impossible.

62. "The greatest attention must be paid to the difference between the signal to advance and that to attack. The first may carry us on for miles, but the second is the warning of a hand-to-hand death struggle. This is a reason for not abusing it; drums must beat rarely, and never begin at a greater distance than 100 yards from the point of attack. In ordinary drill it is better not to use them at all; this is the best way to husband the impression they are meant to produce."

"The attack," writes another Russian authority, General Levitzky, "is a close and impetuous bayonet charge, and differs from the advance in that, once begun, troops move rapidly without disguising their intention, without changing formation, without firing, and try to join issue with the bayonet as soon as possible. For the attack to succeed there must be a settled decision to close with the enemy: the men must be kept in good wind, taught to act by a sudden and prompt onslaught, and lastly, close up at the moment of shock. The dash and excitement in the attack creates a moral crisis, which does not last, but passes quickly, and consequently the attack must be promptly and rapidly terminated; a rapid advance, when prolonged, exhausts men and breaks the ranks."

On the defensive, the advice given by General Dragomirov is, that a bold assailant will not be discouraged by one or two failures, and that it must not be imagined that he will be repulsed for good and all in a moment. Hence a definite resumption of the offensive, after having repulsed an attack, signifies that one renounces the advantages of one's position.

Concerning field days, flying columns, and exercises of minor tactics, there are some very apposite remarks: such manœuvres are good practice, and develop initiative, but they *do nothing for will*, and may, indeed, have a pernicious influence upon it unless correctives are introduced. The General fears men may lose courage by being perpetually told that such and such an attack is dangerous, and that nothing remains but retreat if a flank is turned, &c. "What a wide field," he says, "on which to upset and overturn those moral bases upon which rest the manifestation of will during the battle—unlimited audacity, rapid decision, energy, determination. No verdict in the decision of the affair must ever be given; where there is no fight there are no victors."

74. "In 'general ideas' for manœuvres all finessing must be avoided, the great thing is to make them as simple as possible. It must be remembered that the objects of a fight, be they never so variable, can be attained by two means only, either by attack or by defence; consequently, in view of battle, there are only two things to learn—to attack with determination, audacity, and skill, and to defend oneself in the same way."

"The detachment on the defensive and that of the attack must be of equal strength, for to fancy that the assailant must be necessarily superior in number, as the German 'manœuvrists' do, is contrary to reality, since in

real business one attacks and fights not only with equal forces, but often with smaller numbers; it is, in fact, to make manœuvres not an instruction, but a game of conquerors and conquered. It is to spread abroad a conviction that the offensive is only possible with superiority of numbers."

"Chiefs must not fear to make faults, for it is this fear which leads to unfortunate habits of hesitation and indecision. Faults must be calmly discussed, not as a reprimand, but as advice to do better."

The General recommends, as a variation in manœuvres, that infantry be taught to get over ground quickly by holding on to the stirrup leathers of the cavalry, or by mounting in rear of the trooper; this need not be a regular practice, he adds, but it is good to understand the method.

The outpost practice advised is as follows: "One company is posted overnight near another; each forms a large circle of double sentries some 25 to 50 paces apart. In the centre of the circles so formed a few stray objects, such as bayonets, cartridge-pouches, &c., are placed, and men are told off to try and creep into the circles during the night, and abstract the articles. Care must be taken that this exercise does not give rise to disputes, or its use will vanish; our object is to make use of what we learn against our enemies. Night duties, patrols, and patrol-ambushes are also recommended for increased vigilance."

In his conclusion to the "Battalion Manual," General Dragomirov remarks that "we live in a difficult time when many problems of destiny are being decided, problems which arise often unexpectedly. To solve such problems with success, a long peace preparation is required, together with hard labour, and many sacrifices. One does not know when the crisis will arise, and this is the reason that one should always be ready to face it with quiet mind and tranquil spirit, satisfied in conscience that one has neglected nothing to deserve victory."

"Officers!" he adds, "you must, first and foremost, know how to hold your men thoroughly under command, and this rather by force of will than by physical constraint; to so command them that they know no voice but yours; that in all difficult circumstances their eyes and thoughts turn instinctively towards you to ask what is to be done. Then, you will form with them a single body and a single soul. For this it is necessary that the soldiers *have faith* in you as a sure guide and true chief; then *they will love you*, and nothing will be impossible to our soldiers. This end will be gained by moral and intellectual superiority over men whose lives are confided to you on the field of battle. If in all situations they see in you a mentor who understands matters better and more than they do, if they see in you a man ready to be the first to do all you demand of them, they will follow you unconditionally and unhesitatingly wherever you may lead them, and they will get themselves killed rather than give up the job you have set them to do."

"Consider the soldier as a younger member of the great military family, and as an integral part of this family; do not forget the saying of Peter the Great that 'the name of soldier is a general and honourable title; that the highest chief and the last trooper are equally called soldier.' In the name of the family take care of the soldier, but do not spoil him; be attentive to his smallest needs (not for show, but for good); but chastise transgressors who dishonour the military fraternity with the inflexible arm of the law. Keep a firm hand. Learn to do your duty, and not argue about it; one does not beat the enemy by phrases."

"Serve as a model to the soldier in everything; he will then become the incarnation of punctuality when on duty, whether in sight or out of sight of his chiefs."

As for field fortifications, General Dragomirov says that in reality these

can be neither regular nor shapely on the battlefield, and that they all depend upon two leading principles: *Make the firing line at right angles to the direction you want to command most efficiently; see that the enemy is unable to enfilade this line.* "All fortification," says the General, "is contained in these two principles; no specialist will discover a third for you. Works of this kind must be limited to what is strictly necessary; they fatigue the men, and obstruct movement."

"All this," says the writer, "amounts to a good deal, and all the same it is not enough; the most complete and detailed instructions are liable to misconstruction, and present gaps; this is why it is impossible to limit oneself to the learning of instructions and regulations, and that it is indispensable to read, read, read, for choice the most detailed works of military history, and the narratives of men who not only have waged war, but have written about it. In particular, plunge deeply into the masterpieces of our immortal teachers, Suvorov and Bugeaud; it is only by impregnating your mind with their spirit that you will gain the art of talking simply to the soldier in a frank and comprehensible manner. But, whatever you read, and whoever is the author, accept nothing as an article of faith. Never give in to the idea that 'So-and-so says this, so it must be right,' but rather ask yourself, 'Why did he say it?' If you discover this 'why,' or if the author gives it to you by deductions, you may surrender, and his idea becomes yours, for you will have traversed the same road as the author in reaching your conclusions. But if you do not discover the 'why,' refuse to believe what the author says, even if it is Napoleon himself. Knowledge and capacity give self-confidence on the battlefield; confidence gives strength to decide rapidly without hesitation, and to execute impetuously without looking back."

In another work, General Dragomirov says in effect: Give me soldiers who don't care for their skins, and I will promise you good tactics. Man, man, always man—this is the first of all instruments for battle. Our modern theorists, he says, forget this too often, and too willingly; the soldier in battle is guided by two instincts, one of duty, the other of self-preservation, the first of these is represented by the bayonet, and the second by the bullet. But to-day one hears nothing spoken of but the progress of mechanics, and the murderous effect of modern weapons. Science in a *pickelhaube* has taken possession of the field of battle, and all who do not prostrate themselves before this idol of the day are reactionaries, narrow-spirited, and behind the age. But all these new incarnations of the god of War only end by killing people, which is an art that dates from Cain, and with all your science and invention you can't kill more than once. It is not those who know how to kill, but those who know how to be killed that serve us in a crisis. You talk, he says, of nothing but losses, but it is not those who remain on the ground who enchain victory to our standards, but those brave lads dashing on impetuously with sound wind and limbs. Therefore, if you must have modifications and transformations, so be it, but revolutions never! There is nothing to make such a fuss about in all your pretended revelations of the science of war. Modern tactics remain substantially what they were in the days of Napoleon. Napoleonic tactics rest on a firm basis, since they consist of principles which can never be affected by changes of armament.

It is here only that we find a true harmony between the action of closed ranks and open order formations, between columns and skirmishers, between fire and bayonet, a system large and elastic enough to enable leaders to act according to their discretion and the circumstances of each case.

General Dragomirov accuses German writers of drawing general conclusions from isolated instances, and energetically exclaims that if we are to quail before the dangers of the front attack, we shall end by undertaking nothing. "The fact is," he adds, "that the enthusiasm of many modern

military writers arises from their not regarding sufficiently, and from every point of view, the first instrument of battle—man, and that in consequence they bow down before secondary instruments whose action has most impressed them during recent events. As these idols of the moment are cast down one by one, so the religion of their worshippers is distinguished by its instability. To-day it is the bayonet and deep formations that are everything, and fire nothing; to-morrow fire and open order, and the bayonet nothing. Some, too, have fallen down before the spade, which they place on a level with the rifle. There are few who, like General Leer and Kardinal v. Widdern, remember that these idols of the day are only part, and not the whole, requiring attention—fire, bayonet, spade, and all formations required in and out of battle."

"The present arms are a novelty, but so is the system of short service, the latter being a far more complete revolution in the drill and training of soldiers than matters relating to fire and open order which provoke so much discussion. But does this mark a new epoch in tactics? No! the principles of regulations have not changed, and a mere perfection of their procedure in application cannot make an epoch."

After saying that each new progress in the manufacture of small-arms has been coincident with the recrudescence of defensive tactics and the art of self-preservation, the General says that "these instincts give rise to those attempts made in war to reach the goal without immediate danger. But," he says, "only those who are resolutely set upon joining issue with the enemy will joyfully approach within close range; the soldier who thinks that a bullet is enough to rid himself of a foe, is already incapable of attacking with the bayonet. All new forms," he urges, "must aim at improving the man; the moral and intellectual side of the combatant must be paid attention to, so that he can withstand victoriously those sudden emotions which disturb and paralyze action; the man's intelligence and spirit of initiative must be developed, so that he may never be at a loss in case of surprises and unexpected events. Coolness and self-possession are the chief qualities, and then suppleness, and the resources of intelligence."

General Dragomirov then urges that the danger in tactics since the days of Napoleon are of quantity, and not of quality; the battalion is now formed by companies, and the chain has greater importance. Those who found their teachings upon the columns of Wagram and Waterloo have recourse to the habitual method of people who wish to justify their illusions, namely, of trusting to exceptions.

The works of many writers, such as Boguslawsky, Wechmar, and Skugarevsky, try to prove that the dispersed order is the sole battle formation for infantry. Compared with the Napoleonic epoch this formation would be no longer a progress but a decadence. The final attack demands great cohesion in every kind of ground; it demands close order imperiously: and by close order is not meant formations from the drill-book only, but all groupings, more or less dense, which so often take place under fire. "If the Prussians," exclaims General Dragomirov, "did not make a practice of attacking in close order, this does not prove such an attack impossible of execution, and the conclusions of the Prussians must not be applied to our men, who are well known to prefer fighting shoulder to shoulder. If a great number of Prussian writers pretend that it is impossible to avoid dispersion under fire, this is their affair: they have their own reasons for saying so, since to recognize the possibility of retaining men in hand under fire, and that those who have been unable to do so are wanting in coolness and moral courage, is all one. Who would make such a confession? Success has crowned their efforts. It is agreed, they are heroes—and what is impossible for heroes is naturally impossible for the rest of the world!"

"It is a principle of wise criticism," remarks the General, "only to use, with all due reserve, the testimony of people who have played the part of actors in events; but our modern writers think differently. The Prussian, they say, has spoken; what further use is there of discussion? It must all be good and beautiful. We have been taught by the lips of masters and—*Basta!*"

The Soudan fights caused General Dragomirov to exclaim, "That savages, armed with lances and swords, should break infantry squares—*squares of British infantry, too, if you please!*" "But," he adds, "the inventors of complicated rifle sights will not understand the lesson: *oculos habent et non videbant*. They will continue to teach that modern infantry is unassailable in front, that such acts are only allowable for savages, and that we are not savages. It will not occur to them as it does to others, that to break squares it will, perhaps, be advisable to become savages. This is the advice I give, however, and the only concession I allow is, that they may take rifles in place of swords, and need not paint their skins black."

THE COMRADESHIP OF BATTLE.

In the third and last part of his Manual, General Dragomirov discusses the "Preparation of the Three Arms for the Comradeship of Battle."

"Comradeship, in face of danger," he says, "is the indispensable and supreme condition for the success of any undertaking in war. All that troops are taught has a single object, namely, to prepare individuals, as well as the various units, to mutually assist one another with absolute devotion and a just understanding of the needs of the situation. Military education teaches the mass to obey a single impulse. In war we march separately but fight united—for mutual assistance: it is comradeship which make us at one moment march to the cannon and at another not march to it."

2. "A single man points out the object to be attained, and this object *will* be attained if the mass has been fashioned so as to strive after it like a single man, without hesitations or reservations. A check implies that the enemy has shown more unanimity than we, but who can we blame but ourselves?"

"Forget yourself, and your comrades will think of you.' Wherever this saying is acted on the mass will act like one man, and a man for whom nothing will be impossible."

"Think of yourself and forget your comrades.' Your comrades will perish, but you will perish with them; for if you only think of yourself, who the devil will trouble himself about you?"

"Instead of a living organism we should get nothing but a decomposing corpse, which would be insulted with impunity by all."

3. "A man of sense does not hesitate to sacrifice arm or leg to save his life. So, too, a soldier, if properly educated, does not hesitate to sacrifice his skin for the safety of his comrades, and of the army to which he belongs. Whoever loves himself better than his company is unworthy of his company; whoever loves his company better than his battalion is unworthy of his battalion, and so on to the highest units."

4. "Chiefs must know how to place individual combatants, and fighting units, of no matter what strength, in a situation where they can render one another mutual assistance, and never risk imperilling this. Herein lies the secret of all tactics in time of war, and the aim of all military exercises in time of peace."

5. "We shall not be in a position to fulfil all the obligations imposed by comradeship unless, before all else, we do not fear death; unless we have trust in our comrades and love them."

6. "In order not to fear death we must be prepared for it, and never leave out of sight the object of our mission : to kill and to die. Let us often recall the fact that we are mortal, and that death seizes us when we think of it least. How many people come out of the hottest business safe and well, while others bid farewell to life for a single false step ? It is by subjecting ourselves to a moral discipline of this nature that we shall not be taken by surprise, even after a long peace, by the necessity of confronting death. He who neglects this essential point of the 'Preparation' lays up for himself the bitterest illusions. Is it not inevitable ? Each year the daily round of manœuvres, musketry, marches past. And then one fine day, paf ! bullets, shells, and bayonets. What a change ! Herein lies the danger of attaching oneself to specialities, when it is a question of war, for between these elements of the thing and the fight itself, taken as a whole, what a wide gulf is fixed !"

7. "To trust our comrades we must begin by knowing them, and we shall love them afterwards if they deserve it. When we do not know people, how can we give them our confidence, still less affection ?"

8. "Thus, the first step is confidence : it means knowledge, but intimate and thorough knowledge, which can only be acquired *on the ground* : it is necessary to know *what* each man can do for the common safety, and *how* he can do it. A thorough knowledge of men's characters is necessary in order to avoid a great misfortune, namely, that of mutual interference, which will otherwise certainly come about in spite of the best intentions to do well."

"In speaking of the procedure of the different arms there can only be question of their true battle tactics, and not of those engendered by peace manœuvres. These latter often destroy rather than prepare true comradeship."

Example : "At manœuvres cavalry promenades right up to the line of skirmishers, while in battle it will be held back a mile or more in rear : a fine way this of reassuring the infantry who, at the first encounter, will fancy that the cavalry has abandoned them to their unhappy fate. Yet, in real business, the cavalry cannot better serve the interest of the infantry : if it draws back, it is not only to avoid useless losses, but to get elbow room and a fair field, for if it is desirous of dealing its blow on a level with the first infantry line, cavalry must keep well back, that is to say, on a level with the divisional reserves, unless an exceptionally favourable piece of cover is available. Another example : A battery comes into action ; it sees infantry alongside and thickets in advance, but sees no one in the thickets : it fancies itself exposed, limbers up, and retires. Retires—why ? Because it has not acquired confidence in the infantry, because it is ignorant of its ways, and does not understand that, since closed bodies of infantry are alongside, there will infallibly be skirmishers out in front concealed by the thickets."

9. "Knowledge inspires confidence, confidence affection and the true feeling of comradeship, which induces men not to spare themselves. This feeling is so important that the most sacred duty of chiefs is to safeguard it as the apple of the eye. No efforts must be spared to keep up and fortify this virtue."

"It is as well to point out, among other dangers, that of harping on the tune of rivalry and self-love. Say to your subordinate, 'This is bad, and that good ; this is an omission.' Never say, 'So-and-so does this better than you.' For with such remarks you will soon destroy all comradeship, and inspire a sentiment of hostility, all the deeper because it will be concealed, against the man who has met with your approval."

"Some chiefs have another fashion of speculating upon the frailty of human nature : they tell each one of their subordinates in turn (confidentially, of course,) that no one does so well as he in the regiment. This is of no use either, for the time always comes when subordinates compare notes, and then they find

'that all do best!' Confidence in the chief's word is lost for ever, whereas it should have the strength of the law. Starting from this I am inclined to think that all classification, after the manner of elementary schools, does more harm than good when applied in the Service: it will inflame the hearts of some with an eager desire to be first, but it contributes not a jot to justify true comradeship."

10. "The aid of one's own people on a battlefield is a very complex matter to insure, and it can only be thoroughly guaranteed by successive stages of preparation and by time. It is precisely this complication of the business, and the length of time that has to be given up to it during peace, that causes men to lose sight of the comradeship of battle, that final and supreme end to attain which all efforts must be directed. To begin with, it is indispensable to rationally apportion the idea of mutual assistance into elementary parts: the instruction must not leave on one side any of these elements, as happens occasionally. We go to work as if it was not a soldier that we wanted for battle, but an automaton or a marksman, &c. The more passionately fervent the disciples of these false gods, the greater the harm done. Do not deceive yourselves: it is not bad men who usually fall into these errors, but the best ones. And the deeper they plunge into a speciality, the more everything else diminishes in value in their eyes. Then comes war, and it appears as clear as noonday that men are incompletely instructed: very good, perhaps, in the secondary business, but ignorant of what is most important."

11. "Armed with the experience of our forerunners, enlightened concerning certain aberrations, and knowing the inner causes of man's powerlessness to resist them, we still may be unable to avoid fresh mistakes. But, at all events, it is possible to avoid a repetition of the old errors, on the following conditions:—

"1st. The whole subject matter must be rationally divided into elements: in other words, tactics must be parcelled out into a series of practical exercises susceptible of being learnt on the ground, and not only by leaflets—in short, tactics must be taught by example, and not by verbal explanations.

"2nd. The relative importance of each of the elements must be borne in mind, and the time must be allowed to each in proportion to its relative degree of importance.

"3rd. Once learnt separately the elements must be grouped together in a regular progressive series of instructions, without sudden leaps from the simple to the difficult. For instance, it must not be imagined that a soldier who has learnt to shoot, drill, thrust, and assault, will be able to combine naturally all these practices. Once for all it is indispensable to remember that each combination of this nature is a *new* branch of instruction, and that it is not possible to neglect any of the special exercises demanded by it if it is desired to obtain a sensible and orderly execution free from precipitation and disorder.

"Is not the same procedure followed in a child's education? To teach a child to read, words are subdivided into sounds and letters, and to teach writing letters themselves into pothooks and hangers. But the child cannot read when it knows its letters, nor write when he can deal with pothooks and hangers. It has to be taught to combine the letters into sounds and words, and pothooks and hangers into letters. What will be the result if we stop short when the child has acquired the art of writing, and only continue to teach caligraphy: what will happen if, instead of teaching him that writing has been taught him in order that he may express his thoughts, we consider writing as an end, and not as a means? We shall turn out a public writer, a copyist, an automaton, all the more incapable of expressing his own ideas by writing as he is more skilled in moulding forms of writing in the absence of all thought."

12. " Now, all elementary branches of instruction are successively taught in the required proportion. . . . "

13. "But it is quite different as regards tactical instruction. In this matter the necessity of a progressive combination of the various elements is not yet completely recognized. It is only lately that the necessity of combining evolutions and ball practice has been brought home to all, but the same thing does not rule concerning traversing attacks and applied regulations. It is the same with other exercises which are quite as indispensable, such as those for familiarizing the different arms with their reciprocal obligations, two by two, before the manoeuvres, and of beginning to practise the command of the three arms combined in a lower rank to what is the rule at present."

14. "In my opinion it is only on condition of making good these defects that manoeuvres can produce good results. The reason is as follows. During manoeuvres marches take place as in war, but in order to carry them out well it is indispensable to learn how they are to be carried out *before* the manoeuvres take place. Infantry again has to face cavalry charges; to do so properly it must learn *before* the manoeuvres how to act in such a case. Cavalry has to attack infantry, another matter which must be learnt *before* the manoeuvres. Infantry and cavalry have occasion to attack and support artillery; all this must be learnt before the manoeuvres. Artillery has to take up and shift its position in accordance with the formations of infantry and cavalry; this again is a matter that must be taught before the manoeuvres, otherwise the three arms, instead of aiding each other, will mutually interfere one with another."

Starting then with this general idea, General Dragomirov begins the third part of his manual by a table, setting out synoptically the various elements of military education, together with their gradual and progressive combination into the most composite movements of all arms combined. He affirms that the final result of this system will be a state of thorough preparation, which will enable any detachment of the three arms to be thought "fit for all the manifestations of comradeship in battle," that is to say, thoroughly imbued with its spirit and capable of deploying all its resources under the conditions most favourable for success.

It is unnecessary to dwell upon the elementary part of the proposed course; the general ideas upon this head have been already given. By far the most important part of the work now under discussion relates to the "demonstration on the ground of the reciprocal obligations between troops of different arms."

Before arriving at this stage, however, General Dragomirov has much sound practical advice to give concerning the preparation of the regiment.

The duties of the chief of the regiment and the adjutant are set forth as follows:—

1. "The chief of the regiment is a great personage; he drives the coach but does not drag it. His action is felt through the intermediary of the battalion chiefs and adjutants as concerns the personnel, through the major in administration, and through the surgeon in sanitary matters."

2. "He is the chief of the regiment, the head of the family, the most zealous supporter of good comradeship, of love and respect for a profession which demands the greatest sacrifice for the sake of one's country. He weighs the value of each subordinate; he intercedes with higher authorities for any of his family who have got into a scrape, if they are worth the trouble."

3. "His word is law to the regiment. For this reason he never throws a responsibility upon his inferiors, but takes it upon his own shoulders, remembering that he is the head and responsible chief of the corps for better or for worse."

4. "He takes particular care of the health of men placed under his guardianship."

5. "In all matters it is for him to fix the object to be attained, to watch ceaselessly the efforts made to reach it, and to insist upon the realization of his wishes. He takes care that all is done well and opportunely, and that all occupations march abreast, that is to say that those that are most pleasant do not receive more attention than the rest. If he demands any novelty he must himself show how it is to be done. His action is felt in the companies through the battalion chiefs, but he must never usurp the functions of the latter, still less must he take upon himself the rôle of company chief.

. . . . In regimental work to pass over the heads of subordinate chiefs is a gross mistake. It arises because it appears in peace that no inconvenience is caused by it. It may be so in peace, but it is different in war. Then it will be too late to expect from your subordinates that initiative and sense of responsibility which you have failed to develop in peace."

"The regimental chief must take special pains in the choice of his staff, more particularly as regards the adjutant. A good adjutant must be neither partial nor an intriguer. He must be intelligent, well educated, and active. He must be on good terms with the Staff of the division; he must remember everything, but not drown himself in trivial matters. The happiness of the regimental family depends greatly upon the adjutant's tact."

General Dragomirov next takes the regiment in rendezvous formation, and sets it several problems, such as an attack by cavalry 1,000, 200 paces distant in front, in rear, from the right or left; the same by infantry and artillery at varying distances and directions. In each case he gives what he considers the best means of dealing with each case in succession.

The next point dealt with is the order of battle in the first stages of a fight.

10. "The infinite diversity of the ups and downs of a fight always lead, at last, either to *rupture* or *envelopment*. For this cause every order of battle must take a shape giving the greatest advantages: 1st, for breaking or enveloping the enemy; or 2nd, for resisting all hostile efforts to break or envelop us."

11. "At first sight it would seem as if a continuous and thick line would be the best formation for mutual assistance, whether against an attempt to break the line or envelop it. The experience of past centuries has shown this to be a fallacy. To begin with, mutual assistance is not easy in such a mass, since men get in one another's way rather than assist one another. Secondly, the adoption of such a formation completely loses sight of a principle of a moral order, namely, that to conquer the enemy it is not enough to kill the greatest possible number, *but to persuade him that he is no longer able to resist us*. It is by virtue of this that a compact and continuous line has always taken to flight when it has been broken through at a single point. The conviction of the impossibility of continuing resistance spreads with rapid contagion; the strongest cord falls if cut at a single point. The long experience of centuries has shown that the line with intervals offers a better promise of vigorous resistance than a continuous line. It has proved more efficacious in sustaining troops who are bearing the burden of the fight, since the reserves which play this part are placed at a certain distance in rear."

13. "It is clear that if it is required to increase the resistance, two or three more lines with supports may be added. But if it be borne in mind again that it is not necessary to break the line of battle throughout, and that it is enough to obtain this result at a single point, it becomes clear that a new preoccupation arises. This is to render easy and prompt the concentration of forces at the point where the shock will take place. It is for this purpose that the second and other lines are kept together as the *general reserve*, since

it is easier when they are kept together to carry them to any required point. . . . Victory is not to him who is stronger than his foe in the sum total of soldiers, but to him who knows how to be strongest solely at the point of impact, and at the moment when the shock takes place. Strongest, not only in numbers but in worth; 100 determined men may often put to rout thousands of militiamen. Success or failure depends much upon preconceived opinion, and in war every effort must be made to make the first affairs turn out favourable."

14. ". . . . Reserves only exist to join the line of battle sooner or later. It is not by their inactive presence only on a battlefield that reserves insure success."

16. "Final success remains with the side which can bring up the last reserve at the end of the battle. *The economy of reserves* must therefore be a capital preoccupation of the commander."

"But this is a double-edged blade; if one delays too long the moment for employing a reserve, the line of battle may give way, and the reserve may only be able to re-establish matters. If only part is employed a new check may result. By the end of the chapter all the reserves have perhaps been frittered away uselessly, and have not been employed to gain a success. Too much haste in reinforcing a line is no better; once all fresh troops are gone nothing can be regained. Troops employed no longer belong to you, and the direction of the fight has gone with the last reserve."

17. "The question of knowing when to let slip and when to hold back reserves is one of the most knotty points to solve. The greatest masters in the art of war have not always done it in a satisfactory manner. During peace exercises the question escapes solution, and even fails to attract attention. It is, therefore, all the more necessary to prepare the minds of troops and chiefs, even imperfectly, for facing without surprise the fatal dilemma when it arises in all its gravity implacable as destiny."

18. "Troops must constantly, persistently, and incessantly be trained to the conviction that only those who endure to the end shall be saved, and that all troops once engaged in a fight remain in it till the business is over, that they may hope to be supported, but never to be replaced. This is the sole possible guarantee for assuring that troops display all the energy and determination of which they are capable. If this is the case, a single one of our units may sometimes get to the bottom of two or three belonging to the adversary, and then the preponderance in fresh troops for the end of the business will be naturally on our side."

General Dragomirov next speaks of orders of battle during the second period of the action. He says that at the moment of impact the order of battle becomes an irregular line, broad at the point of attack and thin elsewhere. The leaders, down to the very lowest grades, acquire an immense importance, companies, battalions, and regiments become inevitably mixed up, but sections and squads may keep together if they are well led.

He then proceeds to speak of the orders of battle of the other arms.

20. "Cavalry and artillery both possess the same properties as the infantry, but pushed to an extreme development, and consequently their orders of battle are only special instances of infantry examples. The properties of cavalry are rapidity of movement, momentary character of the encounter, vulnerability of flanks, cold steel. The momentary nature of the fight makes it useless to think of supports coming from behind, the vulnerability of the flanks renders their constant protection indispensable, local reserves, therefore, become transformed into echelons in rear of the flanks. The cold steel imposes the need of being able to repeat the blows, that is to say of a general reserve. The line of battle thus becomes a continuous line of battle with echelons in rear of the flanks and with a reserve in rear."

"The properties of artillery are long range and powerful fire, incapacity for self-defence and for acting alone; the protection of the flanks of batteries devolves upon the infantry and cavalry; these have also the task of seeing the guns safely through the business in case of attack."

After some remarks about changes of front, illustrated by examples, the General places himself in the position of a Colonel addressing his Officers in front of the regiment, and proceeds as follows:—

33. "You are aware, gentlemen, that lateral movements in sight of the enemy are highly inconvenient, since during the whole of the movement there is no fraction available to repulse an attack. The movement itself, with the flank presented to the enemy, exercises a bad effect upon men. This is not all, for lateral movements are seen by the enemy as soon as begun, and consequently they expose our intentions too soon. Now, in general, and I beg you will remember this, gentlemen, the longer you can conceal your intention from the enemy the better you will succeed. The best way to succeed, therefore, is to prolong the line in the required directions by fractions drawn from the reserve."

Examples of this action follow, together with advice to practise the withdrawal of fractions of the front line in case of overcrowding, or rather overlapping, during an advance, as well as the filling up of gaps caused during a similar movement.

The General next proceeds to speak of reinforcing the attack, and restoring order after the assault.

36. "Gentlemen, one seldom dislodges with a single blow an adversary who has made up his mind to defend himself: once must return to the charge once, twice, three times, or more, until one has gained one's object. In this matter all depends upon perseverance. So soon then as the attacking troops have been checked, fresh bodies must be thrown forward from the reserve. It is a rising tide whose waves must succeed one another without interruption. As a general rule, gentlemen, once the first blow has been given one must strike, strike, and strike again, blow upon blow, in order to give the adversary no time to recover. . . . As a general rule, upon the order to attack, the foremost lines march straight to their front without attending to signals. But to-day when I sound 'Halt,' the front line will stand fast until the second line comes up. Both will then advance together. I shall sound the 'Halt' again; the advanced line will again wait until the third line joins it, and then all will advance together. Your men must march shoulder to shoulder in earnest, that is to say, come up between the files of the units in front of them, so that the body attacking forms a compact mass. The assault must take place at a rapid pace; in an attack there must be no promenade or procession. After the attack make no attempt to restore order; I shall put out the markers and sound the 'Assembly'; we shall see then whether men have their wits about them."

37. "In order to give everybody an idea of what precedes it is quite enough to allow a single drill during the summer. We must beware of the tendency which impels us to seek perfection, and what is called 'purity of execution.' The field exercises, if thoroughly well known, that is to say, if all movements are made with order and precision, furnish the necessary means for executing the drill in question¹ with all due correctness.

"It is also necessary to keep watch against such miserable little practices as that of seeking at how many paces distance, or at what particular point, such and such movement should be begun in order to obtain a 'purer execu-

¹ Except the shoulder to shoulder of the attack. Here it is absolutely necessary to demand compactness in the mass and the intermingling of units, since this is inevitable in reality.—*Note by General Dragomirov.*

tion.' It is just this that ruins the whole thing, for the attention of men is directed not to the thing itself, but rather to the sealed pattern method of doing it, agreeable to the eye in peace but inapplicable in war."

The General then exclaims against the practice of requiring rigid formations for supports of the attack, turning the attention of the leaders from their chief duties, which are :—(1) To keep their men under cover, and (2) to be always in a position to support the front line. Nature, he says, does not take care to devise shelters for us always parallel to our front. To demand alignment for the chain, for the supports, and the reserves is a baseless pretension ; the parallel direction of fronts alone is obligatory.

Taking as his text Souvorov's saying that "Each soldier must understand his manœuvre," General Dragomirov next proceeds to direct attention to the "importance of acquiring the habit of giving, transmitting, and receiving orders in a proper fashion."

40. "*The chief must give short, clear, and energetic orders, following the hierarchic scale, and indicating the object to be attained without entering into minute details of execution. The Officers charged with the transmission of these orders must be personally known to his immediate subordinates.*"

"Every Officer who is given an order for transmission should write it down word for word and repeat it. If there is something he fails to understand he should require an explanation. In case of doubt about the bearer of an order he should be detained until the point is cleared up. The Officer who receives an order must remember that in case of a misunderstanding he will not be able to justify himself by saying that he has obeyed an order unless he is in a position to indicate the name of the bearer."

41. "It is thus impossible to proceed instantaneously with the execution of an order, as of a command ; the habit of giving, sending, and receiving orders requires careful attention ; it is difficult to form any idea of the innumerable mistakes which arise in war from neglect of this matter."

General Dragomirov advises laying traps for the unwary in this matter as in others. He suggests that an incomprehensible order should be given to a galloper with every sign of impatience if a repetition of the order be demanded. If the galloper renews his demand for explanations he knows his business, if not his education is not complete ; it may, indeed, prove an utter incapacity for transmitting orders. In the same way it is suggested that an order should be sent to a company chief, without considering the "usual channels," and it should be observed whether the Officer in question acts upon the order or not.

General Dragomirov next speaks of the mutual obligations of the different arms, and placing himself in the position of the director of an exercise addressing the Officers of an infantry regiment and a battery, proceeds as follows :—

"You are aware, gentlemen, that artillery cannot defend itself alone, and that the care of its defence is the sacred duty of troops near to it. The comradeship of the fight demands it. It is in the name of this comradeship that artillery opens the way for you, whether through living walls or walls of stone. In our turn we must do something for it, for it is only on this condition that it will dare to occupy at need the most risky positions in aid of infantry, since it will be sure of never remaining unsupported and without protection. The duties of the support are as follows :—When a battery comes into action, the skirmishers clear its front, and take post right and left far enough in advance to prevent the hostile skirmishers from killing men and horses in the battery. . . . When a battery comes into action on the flank of a line, the company in reserve of the nearest battalion covers the exterior flank of the battery ; if the nearest infantry is in closed ranks the nearest company takes up the duty. If a battery changes front the

infantry follows suit, sending skirmishers in the new direction. . . . The reserve of the troops supporting the battery have the duty of watching for any hostile attempt upon the battery, and of repulsing any such attack. It may happen that the best position to take up is in rear of the battery, for it is only prejudice which repeats the formula that this must not be done; and the important matter is not to keep a vacant space in rear of the guns, but to see that projectiles directed on the battery do not fall among the infantry."

"If the proper conditions of cover are realized in rear of the battery, take up your position there by all means; such position will give you the advantage of being able to fight between the guns if the battery be attacked. In general one company for a group of two batteries may be considered a fair allowance; it is needless to say that a battery remaining well in rear of our fighting line needs no immediate support."

After various recommendations for the action of the support in case of advance or retreat of the guns, General Dragomirov continues: "Do not forget, gentlemen, that the loss of a gun is an honour for artillery, because it shows that the battery has remained in action to the last extremity, and has done all its duty. But it is a dishonour for the support, because it proves that it has allowed its comrades to be sacrificed. In addition, gentlemen, let me remind you always to give place to the guns, because artillery is more dependent upon ground than we are. Lastly, I must beg infantry chiefs who have to command detachments which include artillery to limit their orders to this arm to the determination of the point they desire to make an impression upon, and of the number of guns they require for the front line and the reserve. Do not trouble yourselves about the artillery positions, nor changes of position—this is the business of the gunners. The more clearly you point out the object you wish to attain, the more you abstain from interfering in details of execution, the better off you will be. But the reservation of part of your fire, and the entry into action of this reserve, must remain absolutely in your hands. In a word, no gun must quit the line of battle without your orders, any more than one of your companies." Addressing next the gunners, the General says:—

"Gentlemen, you have no means of personal defence; it is a matter, therefore, about which you need not concern yourselves, and you must draw from this incapacity to defend yourselves, the resolution necessary to plant yourselves down in the most exposed situations whenever the safety of your own people, or the destruction of the enemy, demands it; in such a case, your friends will look after you. The battle is an affair where success is only possible for him who does not fear death. Don't be afraid of losing guns; those who lose guns are the men who remain in position to the last extremity, and sacrifice themselves for the safety of the infantry. You are completely free in your manœuvres During an offensive march you may change position or not, at your goodwill and pleasure, and I only make one reservation, which is that on flat ground you are not more than 200 yards in rear of the fighting line. In advancing, do not necessarily restrict yourselves to a perpendicular direction, as we find so often and wrongly recommended, but bear off to a flank if an advantageous position offers *No single gun must be brought up from the reserve to the position without orders from the chief, and, more important still, no single gun must be withdrawn from the position to the reserve.* This is one of the exigencies of subordination in battle, that is to say, the direction by a single will without which success becomes impossible. A battery which abandons the fighting line without orders is dishonoured as much as a body of infantry daring to do the same. No pretext can justify such action. Are your projectiles all spent, your guns dismounted, and gunners killed—no matter, stand fast. Can you fire no longer—no matter. For it is only you who know the cause of your

enforced silence ; the enemy is ignorant of it. Remain, therefore, in position to keep up the moral courage of your people, and inspire the enemy with a salutary prudence. Avoid changes of position under 400-500 yards."

The General next advises that the infantry regiment should inspect the artillery material on the ground—examine the harness, and method of limbering and unlimbering, of laying a gun, and firing. Various exercises are then proposed to teach the mutual obligations of the two arms.

In much the same manner, and in the same familiar strain, General Dragomirov offers advice to infantry acting with cavalry. He begins by placing the latter a mile in rear of the infantry, and requests both arms to train their eyes to judge this distance, and to look upon it as the proper position for cavalry in open ground. The place for cavalry with a small force is, he thinks, in rear of the centre, with eyes on both flanks, that is to say, Officers' patrols ready to call up the cavalry if an occasion offers. Infantry, he adds, must make room for cavalry as for artillery. The next paragraph, although referring solely to cavalry, is too remarkable to be omitted.

55. "You are aware, gentlemen, that the weak points of cavalry are the flanks: try then to reduce, instead of to increase, the number of these. If, with two squadrons against two, you detach one to outflank the enemy, you will have four flanks instead of two, and you proportionately increase your chance of being turned in detail, quite apart from the fact that once you have given the word you will find it difficult to regain control over your detachment. Besides, by such an act, you expose your game too soon. Keep, on the contrary, all your forces well in hand, avoid being turned by echelons, and work round on the enemy's flanks without his perceiving it. If you succeed, spring upon him like a cat upon its prey, and everything will go well. Don't imagine that you absolutely must charge because you are within charging distance, but, on the contrary, give your enemy rope; he will probably expose a flank, or make some mistake—then make your spring in good earnest. In a word, take the cat for your model—I don't know a better for the cavalry fight. In reconnaissance, on the other hand, act like a fly, if you are brushed away from the nose, buzz round the ear, if brushed away from the ear, settle on the forehead, &c."

It is then recommended, as before, that the mixed detachment should form acquaintance by mutually traversing each other's ranks. After this the drills begin, and various exercises are proposed, the main object being to insure that in each movement the three arms not only work *individually* well, but work *in conjunction*, mutually aiding and assisting one another. General Dragomirov is of opinion that cavalry regulations as applied in peace do not oblige the eye to appreciate considerable distances, since the necessity only arises when acting conjointly with infantry, and that, in consequence, it is indispensable before attempting manoeuvres to point out the reciprocal relations of the three arms without troubling oneself about a tactical idea. Separate exercises of cavalry, he says, develop in the arm the habit of relying in all things upon itself, until it is by no means rare to see cavalry acting on foot in presence or in face of real masses of infantry; in such a case, an infantry company could do more good than a whole cavalry regiment. In consequence, he thinks that cavalry never expects aid from the infantry, nor thinks much about giving it.

Examples are next given of a march executed by a detachment of the three arms, in expectation of an encounter. It is advised that the Officers should be assembled before the operation, in order that the general idea may be thoroughly impressed upon all by the aid of explanations and maps.

Placing himself again in the position of director of the exercise, General Dragomirov gives various pieces of advice about the execution of the plan. Among other points, he touches on march-discipline: "Leaving the ranks is

not a necessity, but a bad habit. It is curious that a soldier who will not dream of quitting the ranks during the longest steady drill, will fall out during a march to arrange his gaiter, or for some other purpose. All this is a matter of habit, and can be avoided. All these halts destroy order, and are bad for the soldier, since while he halts his company have perhaps advanced 100 or 200 yards, and the man has to double to rejoin them—nothing fatigues a foot soldier like an uneven pace in a march. In order to put an end to this pernicious custom, I advise a halt of from ten to fifteen minutes for every hour's march; you can then demand that no one shall leave the ranks on the march. Warn your men, and see to this. It is the company Officers only who can manage this. It is they who are the fundamental pivots for the maintenance of order. Another bad habit is that of doubling up after traversing a narrow defile; if this deplorable error is made four or five times during a march, the strongest men will become stragglers. The most rigorous equality of pace must be maintained in a march. Whenever such a case occurs as the passage of a narrow defile, the head of the column should be halted, in order to give the rest time to close up without increasing the pace. I advise the same principle to be adopted in an attack through cover. It may seem to some that by following out this method the march will be slower. No doubt it will, but the question is to know what result we obtain. It is necessary in this matter to bear in mind what we want to obtain, and at what sacrifice. In the matter of marches, it is necessary to arrive as soon as possible, to preserve order, and to husband the strength of the men. What would happen if we only thought of the question of speed, and abandoned the pace of a league an hour consecrated by secular experience for infantry marches, and increased it to 6 verstes an hour, for instance? We should ruin our men, and only march 18 verstes in the day, while with a march of 4 verstes an hour we can march 25 to 30 easily. In the method I advise, the delays consist, first, in the halt after every hour for a quarter of an hour, and, secondly, in the halts of the heads of columns after the passage of a defile. Let us see how this will shorten a march of, say, 30 verstes with four defiles, admitting that we divide the march by a longer halt after marching 18 verstes. These 18 verstes will take $4\frac{1}{2}$ hours; four halts of a quarter of an hour each make another hour, or, not counting the regulation halt soon after starting, three-quarters of an hour. During the second half of the march the same halts take half an hour—total for a 30-verst march, $1\frac{1}{4}$ hours for the hourly halts. The sacrifice, to my mind, is nothing if order during the march can be obtained at the price."

"Now, let us see what delay we get by halting the head of the column, in order to abolish the inevitable tailing. If the tailing of a battalion through a narrow way equals its length, that is to say, that instead of covering 350 paces, it covers 700, it is clear that unless the head halts the tail must double for $3\frac{1}{2}$ minutes. If the head halts, the tail closes up in $3\frac{1}{2}$ minutes. Is it reasonable, in order to gain 300 paces, to make tired men double in full marching order? The sick and stragglers increase greatly by such action. It is true that with a regiment the delay becomes 15 minutes, and with a division an hour, but this only proves that we should try and obviate all causes of tailing."

The General then notes the importance of continuous and accurate reports from the head of the column. Lastly, he says:—

"For the love of God, gentlemen, don't be afraid of making mistakes, and, above all, decide without hesitation. We are here for instruction—it is impossible not to go wrong sometimes, but he who fears to make a fault will never learn. Faults have their value, since they provoke explanations, and are consequently more instructive than correct solutions."

General Dragomirov next gives a piece of advice to the Umpire-in-Chief.

"In all remarks and advice, speak as follows: 'Yes, it is not bad; but if you had taken into account this and that, you might have done so-and-so.' Never say, 'You did quite wrong; what you did was contrary to common-sense.' With the first method, Officers get to like the business, and, little by little, get as keen as possible; with the second method, they go about their business in a half-hearted way, secretly detesting the whole affair, since at each moment they expect disagreeable consequences."

"This method, skilfully employed, makes people very fond of tactical exercises. Everyone must understand that these observations are only in season during an academical discussion: that on the ground no discussion is possible: here there is only one law, 'Obey my bad inspiration, not your good one.'"

The next practical exercise recommended refers to sealed orders.

A column marches: its commander receives sealed orders, which are only to be opened when the column reaches a named point. This order, for instance, says that some bridge on the line of march is broken, and demands what dispositions the commander will make. Other communications of the same nature state that various unpleasant things have happened, and ask similarly what dispositions the commander of the column will make.

On the subject of marches of several columns, the importance of reports, stating the positions of the column during the march, is fully brought out.

"I also beg of you, gentlemen, to remember the saying of '*March to the cannon*.' This is obligatory upon the chief of every column, unless engaged in some special mission, but it is obligatory in a judicious and intelligent sense. If a detachment is marching in three columns, and the battle begins on the left, must the centre column at once march to the cannon? No; because this would completely isolate the right column and expose it to the risk of being beaten in detail. . . . However much one may be animated with a sincere desire to dash off to the aid of a comrade, one must not abandon one's direction hastily. If one does this the slightest advanced guard skirmish will cause a change of direction, and in the end exhaust men."

Speaking next of the "general ideas" of manœuvres, General Dragomirov offers some very sound advice.

80. "Simplicity, in the general idea, is demanded for the sake of the troops and for the moral hygiene of the leaders. A man who is accustomed in peace to consider complicated and subtle combinations as the best, will also be tempted in war to prefer them to simple plans. This is a most dangerous tendency, for in war and in battle all is done simply, and complicated schemes generally breed failure. It is only natural that it should be so, for the more complicated a plan the greater the probability of someone or other making a mistake about it, and unanimity of action vanishes. The execution of a complicated plan is particularly exposed, by its very complication, to the dangers of the unforeseen. The tendency to complicated plans shows an absence of real judgment in a man, since it proves that he expects success from his complicated combinations, and yet success depends wholly upon two conditions, namely, the resolution of the troops to sacrifice themselves, and the clear idea they have gained of the wishes of their leader."

It is recommended that all chiefs, down to company and squadron leaders, should be called together and made to rehearse, on a small scale, the general idea proposed, so as to thoroughly insure unanimity and a correct appreciation of the manœuvre. These chiefs have then to explain the plan to the non-commissioned officers, and the latter to the men, since it is only possible to execute well what is well understood, and the habit of explaining an impending manœuvre necessitates practice.

Turning next to manœuvres in general, it is laid down that these should

aim at inculcating sound habits and not at creating a military panorama. "There can be no question of victory nor of defeat; where there has been no contest there can be no victories."

96. "The first thing that the chief of a detachment should do is to pass along the ranks and receive from the troops the honours due to his grade; this is necessary in order that every man may see who is the chief."

97. "Orderlies must be chosen from the troops, so that the chief may change his position as little as possible during an affair: this is one of the fundamental conditions for maintaining union of action."

102. "During manœuvres artillery and infantry must never fire on the off-chance: shells and bullets must be husbanded. Infantry must bear in mind that volleys beyond 300 or 400 paces are so much shooting into the blue, and that it is only in the pursuit that volleys may be fired up to 600 paces. No soldier must fire a round without calculating the distance, raising the sight, and taking careful aim."

106. "In battalion exercises it is as well to know all that is going on a mile off on the flanks: in regimental exercises this will be 2 miles: if we act like this there will be no surprises."

107. "It is foolish and unreasonable to get in a fluster, because of a turning movement. It is not the turning movement that is to be feared, but the surprise, and this can be looked to, first by flankers, and next by making a careful estimate of the enemy's numbers."

108. "To be never too early and never too late is a great quality, but it is particularly important in those who dispose of the well-being of many thousands of men. This quality is a professional duty for chiefs to acquire, and can be only learnt by accustoming oneself to exact punctuality."

After advising Officers to take note of the appearance, order of battle, and probable numbers of an opposing force, the General says:—

120. "It may seem that, since the strength of each side is known, there is no need for making calculations. But, on the contrary, one can only learn with the data before one, and what is necessary to be able to appreciate, is not the composition and strength of the enemy's forces, but the impression which troops of a given effective strength produce upon the eye. It is only by taking the trouble to analyze this impression that one acquires the faculty of solving the opposite problem when it presents itself, namely, of estimating the strength of a force by the impression produced upon the eye, as well as the intentions of the enemy by the grouping of his forces. The latter data can only be learnt by constant and persevering practice."

The General next discusses alarms, false and real, and speaks of the need for calmness instead of agitation: among other pieces of advice, he proposes that the bugle sound of the "Alert" should not be a sudden blast, of a nature to excite men's minds, but something of a soothing nature.

On the subject of night marches there are a few remarks deserving of attention.

124. "On the offensive, night marches enable one to approach a foe in secret: during a retreat they allow one to retire at leisure: night actions impose on an enemy by the surprise they cause; they deprive him of the possibility of judging of the numerical strength of the attacking force, and entirely destroy the efficacy of his fire. This is the reason why great things can be done by night with a handful of men, and why the practice of marching and acting by night will gain in importance as firearms become more perfected. But night marches are hazardous: it is easy to lose one's way and mistake friends for enemies: the smallest obstacle becomes an impassable barrier, since the imagination is easily excited. For this reason it is indispensable to practise night marches, so that men may learn by experience the difficulties of the operation, and get accustomed to overcome them quietly

without losing their heads. In this matter the most detailed prescriptions are useless without practice. It is advisable for each unit, beginning with the smallest, to practise this kind of march annually, and then later on, in concert with the other arms, up to the largest units."

The following should be part of the ordinary routine in night marches:—

(1.) Men should be left at all cross-roads, to point out the road taken by the head of the column. Each larger unit takes forward the party left by the preceding column, and drops one in turn. Chiefs of units must know exactly the order of march of the column, and of other columns right and left.

(2.) Men must be thoroughly taught by means of repeated verbal explanations, and then by traps laid for them, that it is a criminal action to fire at night, not only during a march but also in an action; whatever happens the march must be silently carried out straight to the front, and if the enemy is encountered, only the bayonet must be used.

(3.) Perfect silence and no smoking must become a matter of routine.

(4.) The most rigorous order must be kept in each company. In addition to the regulation distances between battalions, some 10 paces distance between companies should be kept, so that an unexpected check in front may not be felt too suddenly throughout the column.

"The service of security during a march is carried on by parties at no great distance, and solely on the roads; the parties are always composed of several men. When the attack begins the general direction should be ordered towards some distinct object, if such exists. In consequence, it is advisable to avoid pitch-dark nights, whilst it is also advisable on clear nights to approach by keeping in the valleys."

"In an attack cavalry and artillery should be at the tail of the column; in a retreat they should be at the head. In arranging for an attack it is best, when circumstances allow it, to regulate the march so as to fall on the enemy just before dawn. If only small numbers are available for the attack, it is best to fall upon the enemy in the middle of the night."

"All this advice, however, is worthless without the habit of marching at night, and therefore my advice is practise! practise! practise!"

The last recommendations given by General Dragomirov refer to a special nature of training originated by the General himself.

146. "The present work would be incomplete without a few words on how to train men to stand fire, but the system I advise can only be applied by permission of the authorities. It is incontestably easier to teach men to fire than to keep command over themselves under fire. It is necessary, therefore, that men should acquire the habit of facing danger unflinchingly. This can be done as follows:—A man stands in front of a canvas target; a good shot with plenty of nerve shoots from a rest 50 yards distant, and fires three or four rounds into the target right and left of the man standing in front of it. This exercise should be proposed as a voluntary game of boldness, and must not be considered an obligatory test."

"The annual practice of artillery can be utilized by making infantry and cavalry drill in the zone between the batteries and the targets, taking care, of course, that the projectiles fly so far overhead that there is no danger. The same system can be carried out by two opposing artilleries, each firing at targets beyond the other."

This proposal raised an outcry against the General when he began it by having his own silhouette neatly executed upon a target during his command of a division before the last war. The fact is that this proposal, although theoretically excellent, cannot be carried out on a large scale without accidents, and that the force of public opinion, even in Russia, would oblige the abandonment of such a practice after the first mishap.

Such then are the teachings of the Russian national school: ably expounded by this original and energetic writer, they contain advice on almost the whole duty of the soldier; they are remarkable for clearness and common sense, and they appeal directly to the best sentiments of the human heart.

General Dragomirov forsakes the beaten paths of German military pedantry, and takes mainly into account the first instrument of battle—man. He studies human nature, the motives that sway men's minds, the weak and strong points of the Russian character, and, after strengthening the moral fibre of the individual soldier, attempts to establish on a sure foundation a truly national school of tactics. Nor does Dragomirov, or the school he so worthily represents, preach a blind obedience to cold steel or antiquated methods of attack in heavy columns; on the other hand, they cling tenaciously to tactics of decision, and by idealizing the bayonet, by training men practically to wield it with vigour, and by impressing upon them the conviction that at close quarters nothing can stand before them, they go far to shorten and abridge the initial stages of an infantry attack, and hurry men forward to that crisis of the affair in which they have always been taught that they are invincible.

It must be repeated that to this school the bayonet is not a god but an emblem: an outward and visible sign of that vigour and energy imparted to his troops by the impetuous Souvorov; that the lines of thought and action adopted do not necessarily impose heavy columns, and that the necessities imposed by modern infantry fire are fully understood.

It has been a great misfortune that ever since the war of 1870-71, nothing has been acceptable to the military world, whether in organization, in drill, in tactics, or even in thought, unless clad in German garb, and bearing the *cachet* of German origin. If this be the usual result of successful war, then victory brings with it a far wider expanse of conquered territory and subject nationalities than are trodden under heel by the conquering battalions. But it is time to ask, Is German organization suited to our social, political, and geographical position? Is the German galley slave drill of a nature to be appreciated by a volunteer army? Are German theories concerning tactics necessarily infallible because they are German? Are the lines of German thought, dogmatically expounded in the dull monotony of the *Bürgerschule*, followed up in the universities, and carried out in the army, suited to a nation with the inestimable advantage of a mental and physical training far more capable of combining in its greatest men the best habits of thought and action?

Certainly it is equally futile to take Dragomirov's teaching and apply it literally, since the whole nature, education, and surroundings of our men and the Russians are widely different. But Dragomirov's writings are refreshing to those who have long groaned in the tyranny of German bonds, and have refused to bow the knee before the German fetish, since they aim at replacing this uncongenial religion by a national propaganda founded on the best instincts and traditions of a great army. No one more than General Dragomirov himself would probably acknowledge the excellent qualities of the German Army, its thoroughness, remarkable organization, and splendid vitality; but an attempt to engraft German military customs, ways and means upon another nationality differing in all conditions of existence, is little less than a crime, since it acknowledges that this nationality has a barren past, a hopeless present, and a future without issue.

The Russian school preaches above all else the national idea in language comprehensible to the humblest soldier; it treats with contempt the doctrine of forms, distances, and intervals, so dear to some tacticians. To those whose whole soul is absorbed in contemplation of distances and intervals

between units in some new form of attack, the writings of Dragomirov will no doubt appeal in vain.

There are some who say, It is quite true that half the military discussions in this country relate to forms and distances of no very vital importance, but it is the only direction in which we get originality of thought, and we can't afford to do without this. But if the only advantage of this originality is to confuse the ends with the means, its particular reason for existing is not clear. Rather, it is better to guide the current of thought into more suitable channels, and to ask ourselves whether the ends and aims held so steadfastly in view by Dragomirov are not the vital essence of military training in peacetime.

THE ORGANIZATION OF A STAFF FOR MILITARY RAILWAY
WORK, AND OF A CENTRAL MANAGEMENT FOR THE
CONTROL OF ROLLING STOCK IN WAR TIME.

By Colonel A. VON FENDRIKH.

Translated from the Russian Military Magazine, by Captain J. WOLFE
MURRAY, R.A., D.A.A.G.

THE successful use of railways for military purposes depends upon the following conditions :—

(a.) *Strategical* : in connection with through lines abutting upon the frontiers ; transverse lines parallel to the frontier ; and those along the whole sea-coast line, with frequent communication with the roads in the interior.

(b.) *Technical* : in regard to the construction, management, and means of exploitation.

(c.) *Juridical* : in respect of the rights and duties of the railway companies towards the Government.

In considering those technical conditions, which embrace the management of the lines and their means of exploitation, we see that the organization of the management exercises the most powerful influence on the success of any military movement.

The regularity of the service germinates in the management of the rail roads, which is the foundation of the productive power or safety of the movement. The most recent tendency in Western Europe and America in regard to the organization of railway matters has been towards a centralization of separate railroads, which, while answering commercial requirements, is still more important in military interests, in that it paves the way in peace-time for uniformity in all branches of the railway service, and in war-time renders it more easy to make use of the personnel, and, more especially, the rolling stock, of many separate railways, for the one general and all important purpose. This aim consists, as everyone knows, of the transport of—

(a.) Reserve men, horses, and baggage, during the mobilization period.

(b.) Of the troops completed to war strength to the theatre of war.

(c.) Of reinforcements, supplies, and other stores for the troops in the field.

(d.) Of the sick and wounded returning home.

(e.) Of the troops returning home on the conclusion of the campaign.

The Ministry of War, as being charged with the direction of the movement over the whole network of the railways, is interested in the union of a number of lines in the hands of the Government or of one private company, so as to have available in war a system thoroughly well organized and prepared in peace, capable of attaining the greatest amount of success in the above operations.

The direction and limits of the work which may be required of the personnel and matériel during any time of strain, such as a movement during war, depend upon the knowledge of the transport capabilities of any given

group of railways, which form the lines of communication, and upon the ability and prolonged experience acquired during peace in the management of the mutual working of such large groups. By attending to these points in peace we shall have at hand all those data which, by determining the suitability of the railways for military purposes, enable us, not only to make correct calculations as to the number of locomotives and coaches which will be required for a given movement, in the most rapid, regular, and economical manner, but also to distribute or mobilize the requisite rolling stock, as well as to direct and regulate the movement throughout the whole system of the lines of communication, just as is done by an expert manager of any railway system in peace.

Such real management is absolutely necessary, because a military movement, from its great dimensions, strains to the utmost all available resources, and frequently necessitates the interruption of regular traffic; and in order to regulate these interruptions and to meet the very serious consequences which result therefrom, prompt and suitable measures such as are readily applicable to the local conditions of the lines are frequently necessitated.

Thus we see the close connexion existing between the conditions of working during peace and war, and the necessity for those sacrifices which the railways must make, in an administrative sense, so that the organization of the traffic in peace-time may answer the calls made upon it in war, when the railways, as part of the defensive system, are called upon to play a prominent part in deciding the question of the existence of the State.

In war-time there is only one superintendent of the traffic. For him all railroads, or groups, forming part of the lines of communications, form one indivisible whole in an administrative sense. Consequently, for the mutual working of the lines or groups, the direction and control of the whole movement should be in the hands of one administration—that is, should be concentrated at one centre, through certain intermediary channels in charge of the lines of communication; and the less the number of these intermediaries is, the greater the chance of the successful working of the military movement.

The experience of the wars of 1866, 1870-71, 1877-78, has given us many instructive examples as to how the organization of railway matters should be arranged in peace.

Thus, for example, there is the report of the railway commission of the 2nd Prussian Army (in 1866) (under whose orders were the lines of the Silesian system, the East Prussian system, the Tilsit-Insterburg and the south-east Prussian systems),¹ which runs as follows:—

(1.) The organization of the transport of the large masses of troops was excellent; but the orders of the superior authorities to the troops were not always sufficiently known to the railway management, in consequence of which, often without any special necessity, special trains were detailed for several hundred men, or for several hundredweights of stores; whole trains of wagons were delayed, or the railway authorities refused to load them, and sometimes trains were despatched at night along railways which were not organized for nocturnal service.

(2.) The division of the military commission of the line into two parts, one temporary and one permanent, is quite useless, and should only be retained in case each of the parts contains all the necessary elements for the fulfilment of the duties laid upon the commission.

¹ The Silesian system consisted of 6 separate railway companies. In all, in the 4 systems, there were 20 separate lines, great and small.

(3.) Requisitions for transport should be handed by commanding Officers directly to the line commission, and on no account to the management of the railways. Only in this way can dispositions affecting the line commission be carried out. After passing gradually through a whole series of channels, they finally reach that commission too late, and so give rise to great confusion. Thus, for instance, one East Prussian battalion was sent off in a direction opposite to that assigned to it.

(4.) The position of the headquarters and of the arrangement of the *etappen* stations should be known to the line commission.

(5.) It is also essential to have a park of carriages and a gang of labourers at the points detailed for unloading stores; or else, in spite of all the stores delivered by the railways, the troops may suffer privations.

(6.) As mail trains and fast trains do not take troops, it may be found possible, by making these trains run in connection with each other on several lines, to transport passengers and goods from one line to another. At the same time it would be desirable to have several such additional passenger trains for military movements.

(7.) In the transport of independent bodies of men, the arrangements for their supply with food should be better than has hitherto been the case.

It would be useful to establish a field kitchen in the trains, so as to distribute hot meals to the individual soldier, as is done on board steamers.

The report goes on to say that in order that the line commission should be able to carry out the purposes for which it was appointed in an efficient manner, it is necessary that they should be provided with all that relates to the transport of troops, and that they should hold the reins of the management, and only then can unity and order in the management necessary for such complicated operations be reckoned upon.

In the report attention is also directed to the necessity of a more economical use of the rolling stock, which is the more necessary as on the German railways it is not particularly numerous.¹ At the end of June there were at Breslau 124 wagons, at Ohlau, 80, at Leven, 250, at the stations of the Ober Schlesische Bahn, 139, at the stations of the Freiburg line, 303 laden with stores and forage, a total of 896 wagons, *i.e.*, about 537,600 lbs. of stores, reckoning 600 lbs. to the wagon.

At the same time it was observed that the management of one railway complained of the impossibility of getting its 461 wagons returned during the course of several weeks, which is a proof of the great delay in this respect. To obviate this defect it is essential to attach to each line commission a bureau, charged with the control of the rolling stock.

In addition to this it is desirable that the Intendance Department should take more radical measures for unloading the wagons without delay, or in the shortest possible period, especially in the case of a rapid forward movement of the troops. For this purpose it is necessary to organize temporary magazines, which is incomparably more advantageous for the preservation of bread than storing it in wagons, which wagons could then be utilized for other purposes.

Although, in case of a rapid retreat of the troops, such magazines would be lost, still the seizure of the rolling stock by the enemy might have still more serious consequences.

The most effective measure for the improvement of the service of the rolling stock is the establishment of a bureau of control for each line commission. This bureau would do away with those irregularities which now

¹ In Germany there are more than 10½ wagons per mile of line; but in Russia about 7½.

occur in the employment of the rolling stock, and in rapid prolonged movements, when it is absolutely essential to return the wagons which have been taken from any other management, and especially in case of the retreat of the army, so as to avoid the rolling stock falling into the enemy's hands.

During the Franco-Prussian War of 1870-71, for the purpose of regulating the movement more thoroughly, the whole German railway system was divided into six main lines of communication for the concentration of troops towards the French frontier from North Germany, and into three lines for the concentration of the South German corps—that is, there were nine lines in all. In consequence of the small number of such lines leading to the French frontier, and the low power of transport of some of them, not merely one corps, but from two to three had to be detailed for each, and on some of them even four corps.

The management of the transport at that time was assigned to special line commissions, which had at their disposal special bureaux of control charged with accounting for, distributing, and controlling the rolling stock; but for the mutual working of the lines there was no central bureau, a fact which considerably interfered with the success of the operation.

Although the necessity for such a bureau was clearly shown by the experience of the War of 1866, for some reason or other, this measure was not taken by the Germans during the Campaign of 1870-71. During the Campaign of 1866, the regular working of the railways was interfered with, during the operation of transporting the various supplies, the sick, wounded, and prisoners, in consequence of a want of system among the secondary authorities, intendants, and contractors, and also by the fact that each line disposed of its rolling stock independently, thus causing a block of unladen wagons, the blocking up of the stations, and a want of wagons for supply (Pierron). Thus the want of a central office, capable of managing the business according to the wants of the Army, made itself felt.

Although the results of the transport in 1870, as regards the mobilization and concentration of the troops, was brilliant, there was at first a certain amount of delay in regularly returning the wagons, as a consequence of which, before the commencement of the movement, the stations at which the troops were to be detrained had to be changed (the troops were detrained at Bingen and Mannheim, instead of at Neunkirchen and Homburg).¹ The local conditions, however, did not permit of the development of the sidings at the stations, or of the construction of additional unloading platforms. The profile of the principal line also was not favourable to unloading the trains in the open field. As regards the supply of the troops with provisions in the theatre of operations, it was at first unsuccessful,² because the experience of the War of 1866 had not been profited by, which

¹ The points for the concentration of the troops of the 1st Army were the fortress of Coblenz, for the 2nd Army the fortress of Mainz, and for the 3rd Mannheim. The detraining had to take place at seven points, viz., at Call, Neunkirchen, Homburg, Landau, Wisloch, Bruchsal, and Carlsruhe. Subsequently the troops had to be moved to Forbach and Weissenberg. The mobilization commenced on the 16th July (1st day), the transport on the 24th July (9th day), and on the 4th August the troops crossed the frontier and defeated Douet's division at Weissenberg. A corps was transported in $3\frac{1}{2}$ to $5\frac{1}{2}$ days. The average distance traversed by the corps of the North German Bund was 368 miles. In 10 days 334,000 men and 100,000 horses were transported, i.e., about a corps daily (33,400 men, 10,000 horses)—1,205 trains were used, each averaging about 96 axles or 48 wagons.

² See "Die Kriegführung unter Benutzung der Eisenbahnen und der Kampf um Eisenbahnen." Von H. L. W. Königlich-Preussischer Hauptmann und Compagnie-Chef. Leipzig. 1882.

experience showed the necessity of having a special central administration charged with the superintendence of the transport of all stores in time of war. Although during time of the war some steps were taken to remove the drawbacks previously experienced, these measures could not be entirely carried out, owing to the abrupt termination of hostilities.

The principal evil which was a drag upon the railways, and consequently was hurtful to the troops too, was the unrestricted use which the intendants and purveyors of stores were able to make of the railways. Thus, one Prussian Officer testifies that he was employed searching for the stores of the 2nd Army for a considerable time, and that he found the greater portion of them near Paris, another portion in the Metz arsenal, but that not only could he not discover the remainder, but he was unable even to find any traces of it. Stores were handed over to the railways on the same conditions as in peace-time, under the idea that the railway authorities would discover the means¹ and ways to despatch and deliver them to the addressees. The various individual consignors did not foresee the consequences of this method of procedure, as they were under the impression that the transporting power of these railways was unlimited. Accordingly they did not hesitate to hand over to the railways for conveyance such a quantity of supplies and stores as far exceeded the first wants of the troops. In order that such a method of procedure should have no injurious consequences for the railways and for the troops, the wagons arriving at the terminal stations should have been unloaded without delay, their contents should have been stored in proper order in the magazines and protected from injury, and the wagons and personnel should have been at once returned so as to clear these terminal stations. But no measures were taken for storing these supplies, either in regard to the necessary store-houses, or in regard to the manual labour required to unload them, or for the superintendence of the operation. Moreover, the troops themselves had not a sufficient train park to carry off from the railway wagons and magazines their full complement of supplies.

The railways which received the stores for despatch were unable to foresee these defects, and had no right to refuse to take the stores, and once taken they were bound to send them to their destination.²

Similar difficulties in the way of the regular working of the lines of communication had been felt by both the Prussian and Austrian armies in the Campaign of 1866.

For the Prussian Army of Bohemia, in 1866, which consisted approximately of 300,000 men and 90,000 horses, 967 tons of provisions and forage were required per diem, reckoning 3·3 lbs. of provisions per man, and 12·1 lbs. of oats per horse. Taking the goods train of 100 axles at 241 tons of useful weight, it would have been sufficient to forward 967 : 241 = 4 trains daily, which, if they had been unloaded and returned from the terminal stations, would not have delayed the whole of the movement along the lines, and so would not have prevented uninterrupted communication with the Fatherland. Having in view the gradual occupation of the enemy's territory, and the possibility of finding some supplies in the country, even at the first and most heated period of the struggle, it is clear that the task of furnishing the army, with due regularity, with supplies might be even still lighter. Accordingly only what is absolutely required by the troops might be issued to them from the base magazine, without blocking the terminal stations, which serve for the detrainment of the troops with wagons.

In 1870-71, an army consisting of 600,000 men, 180,000 horses had to be

¹ Improvisation. See on this subject at the end of the article.

² At this time there were about fifty different Prussian and other railway companies.

victualled, so that the task was much more complicated than in 1866. After the Prussian Army had passed the frontier, two French lines, which were not barred by fortresses, and the technical constructions of which had not been destroyed, were at its disposal for purposes of supply. These were the line Saarbrücken—Metz for the 1st and 2nd Armies, and that of Weissenberg—Nancy for the 3rd Army.

But here, too, as in the Campaign of 1866, there was a repetition of the same disorder, a disorder which interfered with the regular supply of the troops, because the organization of a special central administration, exclusively charged with the superintendence of the transport of stores in war, had not been provided for beforehand.

Although the Prussian Government after the Campaign of 1866 issued special instructions in 1867 regarding the etappen, railroads, and railway detachments, and had increased the transport park, &c., yet they did not create the principal organ mentioned above, upon which the successful utilization of the railways depends. General Pierron very justly remarks that the Germans were not masters on their own lines, but merely lessees, owing to the absence of any law dealing with the services to be rendered by the railways in war-time. Moreover, the superintendence by the line commissions was extremely unsuitable owing to the equal powers of its members.

For the 1st and 2nd Army, quartered near Metz, the line of railway Saarbrücken—Remilly—Courcelles was so far in good order that the first trains with supplies arrived at Remilly on the 13th August.¹ But it was not long before this station, as well as the others lying further back, was blocked with wagons, just as had been the case in 1866. These stations, owing to the slight development of the sidings at the stations, from want of magazines and room generally, and owing to the absence of manual labour, could not be rendered capable of extraordinary work. This gradual stoppage of trains, accordingly, at once made its influence felt upon the whole of the movements in rear along the German railways leading to Saarbrücken, and the difficulties attained a maximum at the commencement of September, 1870. Thus, on the 5th September there were 600 wagons standing on the Rhein Nahe bahn, 560 on the Pfalz bahn, 155 on the Rheinische bahn, 650 on the Ludwigs bahn, 357 on the St. Johann—Courcelles line, or 2,322 wagons in all, belonging solely to the 2nd Army, and containing supplies for it amounting to about 16,830 tons. This quantity of supplies was sufficient for the 2nd Army for a period of twenty-six days. To remedy this state of affairs, recourse was had to the formation of two concentration magazines at Bingerbrück and Neunkirchen. The wagons were unloaded into these magazines, and in addition four trains had to be furnished, each of 100 axles, to deliver the total daily requirements of the army, amounting to about 962 tons; but, as each train transported 253 tons, there was a surplus in case of need of 50 tons. The above-mentioned great block of wagons took place also with the rolling stock, amounting to many hundreds, of the 3rd Army, which was waiting to be unloaded on the line Weissenberg—Wendenheim—Nancy. To overcome this difficulty, two concentration magazines were established at Ars-sur-Moselle and Novécant.

By this means, accordingly, but still with great difficulty, order was established in the line of communications, thanks to the energetic interference of the military administrations of the working and management of the railways.

Thus, for the course of several months the supply of food and forage was carried on regularly for the whole army of occupation to a distance of from 160 to 370 miles from the frontier of Germany.

¹ That is, nine days after the passage of the frontier on 4th August.

We have to add the following general considerations to what has been set forth above, viz., that in peace-time in deciding the various problems with regard to concentration it is necessary also to think out in the most careful manner the question of transporting supplies in trains along the railway, firstly, so as not to have to reckon upon the resources of the country, and, secondly, so as to form an accurate and clear picture of the whole movement of military stores in the form of whole trains, separate wagons, &c., the period within which they should be returned, and their distribution among the stations, and all the more so because such a movement must coincide on some lines with the movement of the troops themselves.

Thus it is necessary to draw up thorough and accurate plans for every kind of possible movement for the whole system of railways in accordance with the quantity and nature of the transport, the entraining and detraining stations; and subsequently, while the transport is being carried out in war-time, to regulate the transport by means of a special central bureau, with subordinate Officers placed under it as intermediaries, that is to say, to act exactly in the same way as a skilful traffic manager of the present day does upon his own line.

Having considered the difficulties which were met with during the military working of the railways by the Prussian Armies in the Campaign of 1866 and in 1870-71, it is necessary to review for a moment the position in which the question of the maintenance of the communications of the French Army was placed at the time of the last war.¹

The French Army in 1870-71 was placed in more favourable circumstances than the German, as it was in possession of a larger railway system and rolling stock. But the French Army was not able to draw the full benefit from such advantageous circumstances in consequence of the absence of the necessary organization in military railway matters. There were three main lines with their branches which served the purpose of concentration towards Metz and Strasburg.

The combination of transport, partly by roundabout lines, in combination with ordinary marching should have been carefully thought out beforehand. Thus to relieve the line Paris—Chaumont a portion of the troops for Alsace should have been moved from Paris along the Lyons Railway, and then through Dijon—Auxonne—Vesoul.

On the 15th July, 1870, the Eastern, Northern, and Paris—Lyons—Mediterranean Railway Companies received instructions from the Minister of Public Works to place all their means of transport at the disposal of the War Minister,² and if necessary to suspend all passenger and goods traffic upon their lines. The Western and Orleans Company at the same time were requested to hand over the necessary amount of rolling stock to the first three lines.

In consequence of these instructions from the Government, the Eastern Railway Company, to whose share from the very first the heaviest task had fallen, took immediate measures to put a stop to the despatch of any fresh goods trains; to unload all covered goods wagons and trucks which were lying at the stations; to diminish the number of passenger trains, detailing them mainly for the carriage of the mails; to prepare, at the stations where troops would halt, means for watering the engines and additional lights; and to send out along the line a time-table of the military trains.

¹ See "Études sur les Chemins de Fer et les Télégraphes Électriques considérés au point de vue de la défense du territoire." Anvers, 1874. Capitaine du Génie J. B. Eugène.

² There was a want of success owing to there being no staff of military persons trained in the management of the service of the rolling stock.

The management of this railway and of the two others¹ furnished an enormous number of trains for the transport of the troops, namely, from the 15th to the 22nd July, 359 trains; from the 23rd to the 26th July, 235—total, 594 trains; making on an average about 59 trains in the 24 hours. While on some days the maximum daily despatch reached as much as 74 trains (22nd July, 1870). But in spite of this, in consequence of the utter absence of unity in the management of the operations by the military authorities on the railways, great confusion took place which showed itself with especial pre-eminence in the manner in which the military transports were received when they arrived by railway at the theatre of war.

In this respect the station of Metz serves as a prominent example of the disorder of the French Military Administration. This station was suited for the unloading of as many as 930 wagons during the 24 hours; while owing to the want of method, an average of only 775 wagons were unloaded during the period from the 16th of July to the 15th August.

At this time the local intendant had received no orders to take over the stores arriving at Metz; and consequently when requested by the railway management to take the stores from the stations they refused. In its turn similarly the divisional intendant refused to unload the wagons, as they did not know whether the transports of their corps would remain at Metz or go further on.

To crown all, the highest military authorities for several days prevented the trains from being unloaded by the following dispositions. The stations received an order to hold rolling stock in readiness to a sufficient amount for the transport of a force of 30,000 men at one time. But inasmuch as this required about forty trains, the company placed them at the stations nearest to Metz, between Frouard and Thionville. Subsequently orders were given for this extraordinary transport, everything was set in movement, the trains steamed into Metz and received counter-orders; again the order was issued, and again counter-ordered. But in the meanwhile all this confusion had of course prevented the other trains from moving and from being unloaded.

There was such a number of unloaded wagons at the station that not only were all the spare sidings taken up by them, but even the sidings leading to the locomotive sheds and the main line were taken up. Thus many of the wagons remained unloaded up to the time of the blockade, and then fell into the hands of the German Army.²

We will give as an example, also, how insufficient preparation and absence of proper method in supplying the troops during their movement caused the army of Bourbaki difficulties which could never be put straight.³

General Bourbaki, on the advice of the Military Delegate, M. Freycinet, on the 19th of December, 1870, commenced to move with 100,000 men through Dijon towards Belfort, to act against the communications of the German Army in Alsace. The French at that time said "in any case we shall be certain to break the base of the enemy definitely." On the 23rd of December the transport of troops began by railway from the stations Bourges, Nevers, and La-Charité. On the 2nd of January, 1871, the corps stood on the line Besançon—Dampierre—Auxonne. Cremer's division was

¹ The time-table was drawn in the case of the first line for 24 trains per diem, and in the case of the second and third for 18 per diem: on the first line the trains were sometimes despatched doubled.

² 16,000 wagons at Metz and other stations.

³ See *Organ der Militärwissenschaftliche Vereine*. Band xxxv, Heft I. Wien 1887. *Die Beziehungen Zwischen den Operationen und dem Verpflegungswesen im Kriege 1870 und 1871*, von Hugo Ritter von Bilimek Oberst und Commandant des k.k. Infanterie regiments No. 20.

at Dijon. The 15th French corps only commenced its movement on the 4th January. Thus the transport lasted more than ten days. The provision columns were moved along the country roads, a distance of 240 miles. The short time which had been spent in preparation, and the absence of provisions, caused various difficulties. The troops suffered privations. There was very little time for rest on the way; they could not cook their food; the provisions carried in each military train were also of very little assistance for this purpose.

The railway being entirely occupied by troop-trains alone, rendered it impossible to maintain communication with the rear, so as to bring up all kinds of stores and provisions.

In Lyons there was a permanent magazine. At the station of Besançon it was intended to establish a movable magazine of railway wagons (*magasin roulant*) with branches at the stations Clerval, Baume-les-Dames, and Montbéliard. But as the railway was fully occupied, the trains with provisions could not be forwarded to their destination. Consequently this plan was only partially carried out.

The object of General Bourbaki's movement was to get General Werder to retire from Belfort. Count von Moltke hastened to warn General Werder that there was no occasion to be specially apprehensive of General Bourbaki, as he could not leave the railway, owing to want of train, but would have to keep close to it.

General Bourbaki inadvertently gave the 14th German Army Corps time, namely, from the 10th to 17th of January, to concentrate upon the Lisaine, and when he decided to take the initiative, he was convinced that, with his starved, half-frozen soldiers, it was impossible to do so.

At this time the French said, "the question of provisions was the capital point."

The supply of provisions was extremely difficult. From the 9th of January the left wing of the French Army received their supplies along a country road for a distance of 14 miles, but even this road, in consequence of the severe weather, frost, and short winter days, took three times the ordinary time to march.

At this time, too, the want of co-operation between the Staff of the Commander-in-Chief and the intendance made itself felt.

Thus, the chief of the intendance trains stated, before the court-martial upon Marshal Bazaine, in 1872:—"I never knew General Bourbaki's plan of campaign. I was never summoned to attend the Councils of War, and I was only summoned on the day of my departure for Pontarlier,"—that is on the 26th January, 1871, when it was too late to save anything.

As may be seen, not only had the principal condition been lost sight of, that first of all it is essential to take measures for the collection of supplies at the base, and then only to think about the concentration of the troops; but, in addition, the railway, during the whole preliminary operation (more than ten days), had been exclusively occupied by the transport of the troops alone, and, lastly, the line of communications had not been properly secured, so that Bourbaki's army could not long hold out.

In general, the causes of the unsatisfactory working of the French railways by the French Army were as follows:—(1.) Insufficient time for the preliminary operations of collecting rolling stock and of preparing the stations for entraining, detraining, and supplying the troops. (2.) The coincidence of the movement of troops with the forwarding of supplies; the indeterminate number of the latter and the consequent checks in the despatch of supplies, and the resulting blocks at the stations. (3.) Want of knowledge on the part of the troops themselves as to the points named for their concentration and for the collection of stores. The War Ministry itself, at that time, did not know

where whole units were to be found. (4.) Uncertainty as to the destination of even large masses of troops, with their trains, their baggage, and every kind of supply. (5.) The absence of a special bureau of control on the lines of communications,¹ which should have had every day all the accurate details for regulating the movement of supplies, the troop-trains, and railway stock. (6.) The absence in the military organization of a central administration for the whole railway system, charged with the management of the movement of all military stores, troop-trains, and railway stock, and with harmonizing all the lines of communication in this respect. (7.) The direct presentation to the railway management and to individuals of demands for transport along the lines, owing to the absence of central and local military authorities, specially organized for this purpose. The railway stations were thus deprived of the necessary support on the part of the military authorities. (8.) The strained relations between the military and technical railway personnel throughout the whole campaign. (9.) The absence of the necessary knowledge as to the working of the railways in peace-time on the part of the military element. All sorts of orders were given by every military commanding Officer, without thinking in the least what the consequences might be. The railway management frequently received contradictory and impossible demands. (10.) The railway management frequently took arbitrary measures for putting a stop to traffic on the line, so as to collect their rolling stock, for fear that it might be seized by the enemy.

Captain J. B. Eugène, of the Belgian engineers, in his above-quoted excellent work, shows that the French should have worked out the question of utilizing the railway for military purposes beforehand; then by making use of the experience gained in the campaign of 1866, they would never have repeated the same mistakes in 1870, which caused so great a loss during the war of the latter year.

Thus, of the whole French park, which comprised 120,000 wagons, 16,000 fell into the hands of the Germans, and 7,500 wagons were taken up by the various military stores (acting as magazines), and stood unproductive at the stations of the Paris—Lyons—Mediterranean Railway line, while demands for wagons were coming in from all sides, and could not be met in consequence of the want of rolling stock.

J. B. Eugène, in our opinion, is perfectly right in maintaining that the establishment of a bureau of control upon the lines of communications will afford a means for regulating the management of the rolling stock, which can be replaced by no other method. Not only will it do away with the irregularity and want of accuracy which would otherwise take place when utilizing the wagons, but it enables suitable measures to be taken in rapid and prolonged movements when it is necessary to call in wagons from other lines, or when, in case of the retreat of the army, it is necessary to be able to take measures for their collection, so as to avoid their falling into the hands of the enemy. The Germans profited by this mistake of the French, and seized the above 16,000 wagons, using them at first for their military transport, and, subsequently, sending them as military booty to Germany, where they used them for their internal communication, and subsequently returned them to France after a considerable time.²

A bureau of control, in the form of a military railway staff, can be the only intermediary between all persons or administrations, both military and

¹ Which we propose to name the military railway staff of the line of communications.

² *Die Eisenbahnkunde* von J. Jaeger Kön. bayer. gen. d.r. München. Leipzig, 1887, § 23. *Die Eisenbahnen und der Krieg*.

civil, and the management of the railways, and can at the same time distribute the rolling stock, as required by circumstances.

In addition to the blocking of the railway stations with wagons, it happened that several French railway managements, fearing to be taken by surprise by the enemy, of their own initiative abruptly put a stop to traffic, and hurriedly collected their rolling stock, so that it should not fall into the hands of the enemy. It is evident that this independent action should not be permitted by the military authorities, as it may frequently cause irreparable injury.

During the Russo-Turkish campaign of 1877-78 our railway system was not favourable for the concentration of the Russian troops, inasmuch as the principal terminal lines ran to Odessa, Nikolaiev, Sevastopol, Rostov, and Vladikavkaz. The main object of their construction had been the defence of the Black Sea coast, and of the Caucasus, so that they could only have rendered efficient service in case Russia were in possession of a powerful Black Sea fleet for the transport of troops to Bulgaria. Bearing this in mind, only the line to Odessa, with its branch from Razdielnaya to Kishineff, as far as Ungeni on the Roumanian frontier, and then through Roumania, *viâ* Jassy, Barbosh, Buzeo, Bucharest, and Giurgevo, to the Danube, was of use for the concentration of the army. In addition to this line there was another which might have been valuable for the concentration of the troops if it had been prolonged further towards the Roumanian frontier, viz., that which runs from Kharkov through Znamenka to Birzula.

Generally speaking, the reasons of the unsatisfactory results from the Russian railways, when used for military purposes, were the following:—

(1.) The insufficient carrying power of the Russian and Roumanian railways for effecting such a large transport of troops; because the railways were only single lines, with the exception of a small section, about 46 miles in length, from Razdielnaya to Odessa; the long intervals between the stations, which prevented more than twelve trains, in each direction, being run in the twenty-four hours. The unfavourable condition of the water supply, due to the fact that the line had been run along the watershed. (2.) Want of rolling stock for a military movement (although there was enough of it in peace-time), in consequence of the delay in returning the empty troop-trains. (3.) The want of readiness on the part of the neighbouring lines in placing their rolling stock at the disposal of the main strategical lines of communications: for the former had no need for it, because their commercial traffic had ceased. (4.) Climatic conditions: snow-drifts stopped the movement for several days, and broke down the telegraph. (5.) The Russian railways were not ready for mobilization.¹ Several weeks before the commencement of this mobilization all the managers of lines had to be assembled in conference at St. Petersburg, as well as the Officers who were charged with the supervision of the movement of troops on the railways and other persons, so as to work out the necessary problems. At this conference, which was under the presidency of the Minister of Communications, it was agreed, among other things, that the managements of the railways should inform the Ministry of Communications, by the 27th of November, 1876, how many troop-trains they could despatch in the twenty-four hours. It was also laid down that, from the date of the order for mobilization, all goods traffic should cease, and that any stores which were in the wagons should be unloaded. Railways which were not completely occupied with the transport of troops were permitted to

¹ For instance, the regulations for the transport by railway of powder and loaded shell were published by the Ministry of Communications only on the 19th of May, 1878, that is a year and a-half after mobilization had commenced.

carry on goods traffic on their own responsibility. (6.) The absence of telegraph communications necessitated the mobilization, which was ordered by the Imperial Order of the 1st of November, 1876, to be reckoned to commence from the 14th November. (7.) Delay in the arrival of the reserve men in some districts, owing to which the main body of the troops commenced their movement on the 10th December, and concluded it towards the end of December. Consequently, from the first day of mobilization, about eight weeks in all were required. (8.) The unpunctual arrival of the rolling stock—that is its mobilization—from the northern railways; the block at several principal junctions and transfer stations, owing to which, and also to meet the difficulties raised by certain contradictory orders, mobilization had to be stopped throughout the whole Russian railway system for thirty-six hours. The railways were then ordered to report, by telegram, twice in the twenty-four hours, regarding the movements of the wagons through the transfer stations. (9.) The absence of organization upon the principal lines of communication, which should have been placed under one sole military authority, who should be aided by military railway staffs or bureaux of control, organized by groups in peace-time.¹ (10.) The absence of organization in peace and war time of any special central administration for the management of the rolling stock, and for the control of its movement throughout the Russian railway system, and for mutual co-operation between all the military railway staffs. (11.) The tardy and insufficient organization of a central organization, which should direct the transports as far as this side of the frontier. A temporary committee, consisting of the Officers charged with the superintendence of the transport of troops upon all the railways of the Empire, and of their movement by water, and of the inspectors of the technical details of the railways under the Ministry of Communications, was only sanctioned twelve days after the declaration of war, and even then there were considerable differences of opinion between the two Ministries. The committee was hastily formed, and was not aided by any regular central administration, such as that mentioned in clause (10), or by any others, such as those in clause (9), which might have been prepared in peace-time by prolonged practice, to carry out their difficult and important work. The consequence of this was, that in addition to irregularity in the movement, the accounts of the railways with the Government, for the use of their rolling stock, appliances, &c., are still unsettled at the present time (that is, more than ten years afterwards), and still give rise to endless discussions. Moreover, some railways had to request the assistance of the Ministry of Communications in making out their accounts for the use of their rolling stock, because the railways in whose hands the wagons were, in accordance with the orders of the Ministry of Communications, would nevertheless make no recognition of the fact that they had taken them over, and that they were enjoying the use of the rolling stock of other companies.

As regards the movement on the Roumanian railways, in addition to the causes which had an injurious effect upon the communications in rear of the army, as stated by persons who were intimately connected with the trans-

¹ An official letter, dated 1st December, 1878, from a member of the Ministry of Communications to the War Ministry referring to the difficulty of settling the accounts of the railways. To remove this difficulty, he proposed to the Imperial Council to form a special committee of four engineers and two accountants. Another cause of delay was the fact that no rules had been settled regarding the transfer and employment of rolling stock. Consequently, from November, 1876, till December, 1878, more than two years had passed without there being any rules. One principal Russian railway company made a claim upon the Government for 230,387 roubles for the irregular use of its rolling stock by the War Ministry.

port work, the following may be quoted:¹—(1.) The low carrying power of the Roumanian railways, which could only run 4 to 5 troop trains in the 24 hours, consisting of from 24 to 35 coaches, because artillery, "pontoons," supplies, and their military stores had principally to be transported. (2.) The inconvenient situation of the station at Jassy, especially as a principal station, since it was surrounded by a marsh, which thus prevented the development to the proper extent of sidings and of platforms for transfer of stores from the wagons of the Russian gauge (5 feet) to that of the Roumanian or continental gauge (4 feet 8½ inches). Many persons considered that it would have been more practical to lay an extra broad-gauge rail upon the section from Ungeni to Jassy, and at Ungeni (the Russian station) to establish an independent yard on the continental gauge to make up and sort the trains. The nature of the locality at Ungeni would have permitted this without any difficulty, but the advantage of laying the section Ungeni-Jassy with two lines of different gauges on one and the same permanent way, in consequence of the difficulties raised by the bridge question, and owing to other causes, was not found to be practicable. (3.) The unsatisfactory technical conditions of the railways; there were frequent cases of bridges breaking down during the transport. (4.) Want of rolling stock and insufficient personnel. (5.) The low carrying powers of the Russian railway from Bender to Galatz, as the line was rapidly constructed between the 1st of July and the 19th November, 1877, its length being 180 miles. It could only despatch 2 trains in the 24 hours, running at a speed of 7½ miles per hour. Some persons think that it would have been more suitable, more rapid, and cheaper to have laid a second rail upon the Roumanian lines. (6.) The unsuitable organization of our military railway branch (as a consequence of the convention) and the fact that our agents were not accredited to the Roumanian Government. The result was that our demands were unwillingly and slowly carried out. (7.) Want of connection between the separate branches of the different administrations. (8.) The utter incapability of the highest Roumanian administration; the rapid change of Ministers of Public Works, who were occupied more with Parliamentary and political intrigues than with the lines of communications. (9.) The unfriendly attitude of the principal director of the Roumanian railways towards the Russians. (10.) A similar feeling on the part of the majority of the lower ranks in the railway service. (11.) Want of care in drawing up the plans for the transport of troops along the Roumanian lines. The necessary deductions from the technical calculations as to the number of trains which the railways were capable of running had not been taken into consideration. (12.) No attention had been paid to the fact that the transport of our troops and of the Roumanian troops would be simultaneous. (13.) The administration of the Roumanian railways frequently had demands presented to them to despatch the greatest possible number of trains without any instructions as to the times at which they should be despatched, or as to the quantity of stores, or as to the periods at which they were to be transported, so that it was impossible for the specialists to take the necessary measures in proper time to economize their means of transport. (14.) The simultaneous movement of troops and stores. (15.) The various departments concluded agreements with their contractors which obliged the railways to transport whatever was given to them without considering whether it was possible within a given time. The result of this was that the calculations as to the delivery of various stores and provisions at the proper time broke down. (16.) The military administration had no control over the railway

¹ See notes on the employment of railways for military purposes by the author of this article.

telegraph, the result of this was that a train with a reserve battalion was left standing at a small station for two days without provisions. (17.) The unpunctual delivery of the number of locomotives which had been demanded to supplement those on the line. (18.) The empty wagons with return trains were not returned in good time. (19.) Intendance, artillery, and other trains were unloaded slowly and unpunctually owing to the absence of labourers. (20.) The starting and terminal points of the road were not properly organized. Credits for work were not opened at the proper time. (21.) A whole series of new works and the bringing up of materials for them were not taken in hand in good time. (22.) The organization of the appliances at the final stations was only taken up when the wagons had begun to arrive at the stations, and required to be unloaded without delay. (23.) Want of accommodation (sheds and platforms) at the stations, delay in unloading, the blocking of the stations with laden wagons, which caused a deficiency of empty wagons at other points. (This shows the use of the timely establishment of special magazines for this purpose, and for the stores of the various departments.) Thus the irregularity in the supply of the troops of all arms with stores, and the ultimate block in the movement of trains, might have been avoided. (24.) Want of sidings and unloading platforms at the stations. (25.) Want of a proper system of water supply and of a turn-table at the station Frateshti. (26.) Interference with details of working (in contravention of Article 11 of the Convention) which gave rise to covert and stupid opposition. (27.) Although the rolling stock of the Roumanian railways had been increased in November to more than twice what it was in June, the number of trains run daily fell from 5 pairs to 1 and 2 pairs. There were altogether 230 locomotives and about 6,000 wagons, and the length of the railway system was 425 miles. Of this number, in November, 1,769 wagons were standing unloaded, and at Bucharest alone there were 600 wagons (the same errors as during the campaign of 1866). (28.) The military railway branch had no spare materials or tools for carrying out works which had been considered by the Commission to be urgent. (29.) Orders given for transport to private contractors caused maladministration, and blocks of wagons, at least 65 per cent. of the total number of unloaded wagons, fell to their share. (30.) The absence of any method of accounting for the movement of the wagons by numbers, or of the goods which they carried, was the cause of stores going astray. For instance, three wagons with Chassepôt rifles, which were to be handed over to the Roumanian Government, were being sought for over two months. This shows the necessity for a bureau of control charged with superintending the wagon service. (31.) At first there were no military means of superintending the transport of the troops, and there was "absence of connection" between the military commandants and the other officials who were managing the working. (32.) There was no thoroughly well thought out plan of organization for the lines of communications drawn up beforehand. (33.) The railways had not been regularly reconnoitred beforehand. All that had been done was to draw out lists of the stations. (34.) There were no special instructions for the line of communications, nor any tables of establishments made out for the military working of the railways in the country in our occupation. (35.) The commandants of stations were insufficiently acquainted with all the details of the service, and of the supply of the troops. They had not any instructions for the making up of trains taken over from the central administration of the Roumanian lines. (36.) The functionaries charged with the working of the lines and the railway battalions had not been properly prepared for their duties as is recognized to be necessary in the first class of European Powers.¹

¹ Military railway sections for working the railways should be organized, and

There should be strict discipline, and the personnel and their capabilities should be thoroughly well known. If instead of collecting men from various railways, without any regularly organized connection, there had been organized, in peace-time, military working sections from men belonging to the reserve who had been trained by long practice, and if these men had been mobilized and handed over to the Roumanian railways, they would undoubtedly have given different results, especially if the technical working of the railway had been carried out on a military footing.

From the above review, which is based upon the experiences of the campaigns of 1866, 1870-71, and 1877-78, we see clearly the necessity of organization in peace-time. Those special institutions which in Western Europe are known as central and local bureaux, whose duties are to regulate the mobilization and concentration of the troops, and their supply throughout the war with provisions, &c.,¹ the evacuation of the sick and wounded, and finally the transport of the troops back again to their own country on the conclusion of military operations.

The complicated mechanism of all the work which is carried out in these bureaux, and their actual relations to one another, require regular and prolonged practice, and accordingly they should be organized in good time, that is during peace. As regards their great use for commercial movements in peace-time, we have already made detailed remarks in other articles.² In conclusion, we think it necessary to quote the opinion of our talented professor, Lieut.-General Leer :—"Finally we should not lose sight of the fact that in order to develop the useful work of railways to the highest possible degree, it is necessary that there should be a clear organization of transport, based upon the methodical conduct of business, and upon a clear division of the whole labour, unity being observed in its general direction. It is only in this manner that order is to be secured. The injury caused by working without plans has frequently been proved in practice. In general, railways should be looked upon as the most advantageous and the most recent development of mobile magazines. Railways facilitate the extension of the sphere of provisioning by means of magazines to an indefinite distance, and thereby make operations, which formerly were not dreamt of, now quite possible; for instance, the stay of the IIIrd and IVth German Armies for a period of four months in the same place before Paris in a country bare of supplies."

"First of all we should think of the concentration of stores at the base, and then turn our attention to concentrating the troops. The requirements of armies of the present day with regard to supplies, both of provisions and of warlike stores, have developed to a terrific extent in comparison with previous wars. Both the preliminary (concentration of stores and troops at the base) and the supplementary operations (the organization of the lines of communication), according to their special peculiarities, should be subjected to the strictest calculation and the most careful organization, and should not be a matter to be improvised."³

they should be placed under the orders of competent persons and staffs. From time to time they should go through an experimental mobilization, and should be tested by carrying out their duties upon lines which are strange to them.

¹ Thus, for instance, we should not have seen that which took place with the Grenadier-sapper battalion. This battalion received its warm clothing in the summer in Roumania, on its return from the theatre of war, that is on its return journey. Many such examples might be adduced.

² An article by the same author in 1883.

³ See Notes on Strategy, by Lieut.-General Leer. "Without time and labour it is impossible to do anything truly great. And if in matters which rise above the level of the moment it should appear that they are due to improvisation, then in

General Pierron, in his work "Strategy and Tactics," 1887, quotes the words of Napoleon I:—"The secret of war is in the secret of communications," which show that as formerly the main roads and rivers, so now railways, form the principal and most powerful lines of communication; but at the same time the most fragile lines, upon the security and organization of which the safety of the army depends.

An army cannot long exist unless it has at least one secure line of communication, as is shown by military history., *e.g.*, the Berezina, in the war of 1812; Metz and Sedan, in 1870; Pontarlier, in 1871.

The more an army is concentrated in a small space, in however rich a country, the less is that country able to supply it with provisions, and accordingly communications and means of transport towards the rear must be especially active.

With a railway system upon which the military management is regularly established there is no necessity to move the *dépôt* magazines a great distance to the front. Supplies can always be brought up, if only the *dépôt* is connected by railway to the Army. It is very risky to place *dépôt* magazines on the frontier.

Major Le Pippre, the chief of the railway bureau in the War Ministry, in the campaign of 1870, specially insists upon the necessity of unity of administration in the transports of every description. One general regulator is required, which should allot to each individual department or branch the duties which fall to their share proportionally, and in accordance with the requirements of the moment.

So as to avoid the blocking of the lines when making use of railways, the following amongst other measures must be kept in view. (1.) First of all, as a fundamental rule, the despatch of trains should be regulated in accordance with the rate at which they can be unloaded. (2.) Every despatch should be made only upon receipt of telegraphic information that they are ready to receive them at the other end. (3.) A special receiving station should be named on each line of communication, on which all stores and men detailed for despatch to the army should be directed. The same should be the case in the evacuation of the sick and wounded, and in sending back the troops to their own country. (4.) When trains cross on single lines the preference should be given to those which are returning from the end of the line (and not the reverse), so as to free the terminal station. (5.) In order to accelerate the unloading of stores and to free the terminal station, each corps should have a sufficient quantity of vehicles to unload the train which arrives for the daily wants of the corps (the day's supply), and also for the organization of temporary magazines when the army moves away from the railway. If this condition is not observed it will lead to the terminal station being congested with stores. (6.) The railway staffs which are established on the line of communication (groups of railways) for regulating the combined service, should

reality this seeming improvisation is to be explained by the fact that someone has thought of these things—that is, has carefully prepared for them—at a time when nobody else thought of them. So that when the moment arrives at which public opinion is directed towards them, those persons who thought of them earlier are found to be the best prepared for them. This is the secret of great doings. It consists in the persevering and prolonged working of the mind in a given direction. Perspicuity, intelligence, and genius consist in being able to foresee what is bound ultimately to attract the attention of everyone, and in preparing for it carefully. It may be boldly affirmed that what has been thought out for a long time and with perseverance is already partially completed." (Carrion Nizas on the Plan of Campaign of 1796, drawn up by General Buonaparte long before he had taken over the command of the French Army in Italy.)

be charged with the collection of statistical information in the form of monthly reports regarding the districts, towns, &c. (7.) By means of these staffs attention can be directed to the capabilities of the railways, which do not enter into the region of the theatre of war, as regards the transport of stores for the army, and as regards passenger and general goods traffic, if such be allowed, and generally as to their powers in case of unforeseen events.

Let us now turn to the consideration of the present position of the question in Germany, Austria-Hungary, France, Belgium, Italy, and Switzerland.

Germany.

In Germany when the major portion of the private railroads passed into the hands of the Government, Herr Maibach, the Minister of Public Works, devoted special attention to meeting the requirements of the goods traffic, without prejudice to the interests of the Government. This was effected by utilizing the existing rolling stock in the hands of those railways, which formed so extensive a park when added together that, by managing it properly from one centre, the most brilliant results could be attained.

It then appeared that the rules which regulated the general interchange of wagons between the various railways were not thoroughly satisfactory, and did not give entirely economical results. This was due to certain exceptions which were made in favour of the wagons of various lines, and also the absence of a central system to regulate the supply and demand of wagons.

Accordingly the Prussian Government appointed a special committee to work out a system of utilizing and of accounting for the rolling stock.

In consequence of these reforms a series of circulars were issued by Herr Maibach, in one of which (viz., No. 4671, of 9th August, 1879) the rules were laid down for the mutual interchange of railway wagons on both Government and private railroads, as also upon the Government lines in Alsace and Lorraine. And finally by the Circular of the Minister of Public Works, of 28th December 1880, published in the "Eisenbahn Verordnungsblatt," a thorough system of recording, and of accounting for, the distribution of the wagons in one central bureau, at Magdeburg, was introduced; the preliminary distribution of the wagons being effected at eight large centres (the local central bureaus).

These bureaus are in daily communication with the railway stations and with the central office by telegraph, and they furnish, moreover, regular daily reports. Thus the whole of the rolling stock forms as it were one huge park, and, according to Herr Maibach's official report, the new organization has already, even in peace-time for ordinary commercial traffic, given most brilliant administrative and financial results.

At the present moment, according to the "Oesterreichische Eisenbahn Zeitung," No. 36, of 4th September, 1887, the system which was in operation in Germany, in 1881, has been still further improved, owing to the special interest and zeal of Herr Maibach in this question.

Moreover, owing to their confidence in the practical character and economy of the Prussian system of utilizing the rolling stock, the Weimar-Gera, the Saal, and also the Alsace-Lorraine, and Oldenburg private railways have given in their adhesion to the system. Taking advantage of this circumstance, Herr Maibach has considered it advisable, according to the "Reglement für die gemeinschaftliche Benutzung der preussischen Staatsbahnen und eigener anderer Eisenbahnen," to decrease the original number of wagon bureaus, and to content himself now with four local and one central general office.

According to the report of the Reichs Eisenbahn Amt, in 1886, with the

exception of the allied States of Bavaria, Saxony, Württemberg, and Baden, there were 17,445 miles of railway, with 201,513 goods wagons at work.

If these be equally divided into four groups, we obtain an average of : (1) 4,381 miles of railway ; and (2) 50,378 wagons ; or nearly 11·5 wagons per mile.

The allied States form special local control bureaux, and have altogether about 49,000 wagons. For distributing the wagons to the coal mines of the Cologne and Elberfeld systems, there is a special bureau at Essen ; for the coal-fields of the Saar basin, there is a control bureau at Saarbrücken.

The local wagon bureau, after completing the distribution of its wagons within its own group, reports the result by telegraph to the central wagon bureau, which, in its turn, similarly regulates all the demand and supply within the limits of the whole German railway system, both Government and private. A payment of about $\frac{1}{2}$ d. per 2 miles is fixed for the use of wagons belonging to companies which are outside the Government arrangement.

The accounts drawn up by the local wagon bureaux are sent on to the central office, which towards the 20th of each month draws up the final accounts of the sums due to the various railways for the use of their wagons. In addition to this, it is the duty of the local and central bureaux to take stock of the whole wagon park, at a certain date and time, at all stations, workshops, and in the trains.

As regards war-time, it will be readily understood that the Prussian Government, by having provided itself with such an organization of the rolling stock service, has secured beforehand the success of any possible mobilization in any direction, inasmuch as the complicated mechanism, required to determine the whereabouts of the wagons and to direct the service of the rolling stock over the whole railway system, is acquired by prolonged practice in peace. And this experience cannot be obtained by any other organization, formed just before the commencement of mobilization or during the campaign itself, which has not trained the personnel to accuracy and punctuality in reporting upon, assimilating, criticizing, and drawing deductions from the material which it has collected.

Not content with the foregoing, the Prussian Government, which has studied in great detail the conditions of the successful use of railways for military purposes, introduced a new Bill into the German Parliament in 1885—the *Kriegs Transport Ordnung*—which was passed on the 26th January, 1887, and published in the "*Reichs Gesetzblatt*" on the 9th February, 1887. These regulations define the conditions upon which railways are to be used in peace-time for military purposes, and also the accounts to be passed between the military authorities and the railway managements for the use of the railroads ; and they further empower the Chancellor of the Empire to supplement or alter, if necessary, the technical portion of the said regulations.

The regulations consist of six sections—

First Section.—General provisions dealing *inter alia* with the division of the railway system into large groups or lines for military purposes, and the system of exploitation, which is of the second class ;¹ the list of trains for commercial and military purposes.

Second Section.—The sphere of activity and duties of the military and civil departments charged with carrying out the regulations ; *inter alia* the staffs of line commandants, whose duty it is to see that the railway manage-

¹ On the 1st April, 1886, of the whole extent of the normal broad gauge Prussian lines amounting to 19,184 miles, the second class system of exploitation had been already introduced in peace-time upon 4,173 miles, *i.e.*, 22 per cent. The working expenses are reduced from 30 to 40 per cent.

ment carries out all the requirements for the defence of the country, demanded of the railways by law upon the subject, to lay down the method to be followed in carrying out these requirements, and finally to superintend their execution.

Third Section deals with the preparation of military transport, the collection of information, the making of reconnaissances, the train service, demands for troop transport, service of personnel and rolling stock. For instance, Section 30, para. 2, lays down that the military railway staff is to regulate the service of the locomotives so as to carry out the plan of the transport of the troops. Section 31—Service of rolling stock; para. 2. In transporting troops in troop trains the wagons are furnished by the despatching station, in accordance with the order of the commandants of lines; para. 3. All wagons of troop trains are to run right up to the detraining station; para. 5. The military railway staff is responsible for the regular return of all empty wagons, and is authorized to alter the direction of returned wagons.

Fourth Section deals with the transport of rank and file, of units with their horses, train, &c., the handing over of wagons fitted for military purposes to the commanders of echelons, the loading, movement, delay, unloading, disinfection, and return of trains.

Fifth Section deals with transport of warlike stores, the rules for the use of the rolling stock, when passing from the hands of one military railway staff into those of another such staff.

Sixth Section deals with the accounting and payments for the rolling stock.

By these new rules, all the lines are placed at the service of the army under military control, so that the railroads in the theatre of operations are worked exclusively by the army for the army.

Since the 1st November, 1886, a course known as the *Militär Informations Cours des Eisenbahn Stationsdienst* has been established under the supervision of the general staff; and this course is attended by Officers and non-commissioned officers of all arms. This consists of two parts: the theoretical, which lasts for two weeks, and takes place at the point where the line commissions are established; (2) the practical, lasting 2½ months, which is held at one of the stations. Officers who have passed this course are detailed, in case of mobilization, to take over the various duties in connection with the military railway organization.

Austria-Hungary.

Since 1878, the "*Vorschrift für den Militär Transport auf Eisenbahn*," 3rd ed., has been in force in Austria-Hungary.

To keep an account of the whereabouts of the rolling stock of the railways in war-time, specialists are detached upon the demand of the central military administration; and these specialists become auxiliary agents for dealing with the rolling stock in its widest sense.

The basis for working out the plan for a movement is the *Transport Entwurf* (or transport scheme), which is received by the central administration from the War Ministry, or from those authorities whose duty it is to despatch the troops. This scheme contains all the information regarding the number of troops and the quantity of baggage to be transported, the sequence of the despatch of the troops, the manner in which the troops are to be distributed among the various lines, the time at which they will be ready to start, the point at which they are quartered, and finally the stations at which they will entrain and detrain, and all other necessary details.

The central administration takes all the requisite steps, in accordance with the above, and gives early intimation to the field administration of all troops

and stores despatched to the theatre of war, so that it may take the necessary steps to forward them on within their own rayon. These transports are effected by through trains, which run from the entraining to the detraining station without making any unnecessary stoppages.

It is the duty of the president of the administration, in case all the demands made upon him cannot be simultaneously complied with, to decide which demand is to have the preference. With regard to the sequence of despatch of the trains, he has to take care that the units of the various arms are distributed equally among each day's trains, according to their number, so as to get the utmost possible amount of useful work out of the rolling stock. He also has the power in distributing the troops among the trains to change, in case of necessity, the sequence of despatch and the distribution laid down in the Transport-Entwurf.

As the employment of railways on a large scale for military purposes extends frequently to a whole network of lines, a line commission for each separate main line, or group of lines, is appointed under the central administration. These line commissions consist of an Officer of the general staff as Line Commandant, and one railway agent, of some standing, to act as a Line Commissary, as he is termed. Officers in command of troops or echelons are bound to comply with the orders of the line commission within the rayon of their authority, even although these orders should be at variance with what is laid down in the routes or plans of the movement. The line commission has at its disposal a certain number of troop trains for return movements, supply of provisions, and stores, and for the evacuation of the sick or wounded.

The total number and the nature of the wagons required is fixed in accordance with the character of the movement, and with the dimensions which it is to assume.

Only very weighty reasons of a technical nature can justify the division of trains or a change of wagons, since either of these processes injuriously affect the success of the movement, because the troops are generally carried in the same wagons from the entraining to the detraining station.

The Etappen Commission, which is located at the entraining station, superintends the entraining, loading, and despatch, and pays special attention to the condition of all the means of transport, taking care that full use is made of the carrying power and accommodation of the wagons, and that the trains are not overloaded. The detraining station is charged with the rapid unloading of the wagons and with their return; and at junctions, with the requisite division and making up of trains.

The convention concluded by the War Ministry with the railway managements deals in detail with all cases in which the total rolling stock of all the lines may be utilized, and provides for their mutual interchange, until the park of wagons is exhausted, and for uninterrupted train traffic throughout the whole railway system; and it likewise deals with the method of accounts and payments. The convention is concluded for five years.

It is the duty of the central military administration to give directions as to what lines are to hand over their wagons to what other lines for temporary use. The railway companies are already provided in peace-time with detailed plans of the distribution of wagons among the stations, and giving the number of trains both for through and local traffic. These measures ensure great accuracy and economy in all respects, and further secure the success of the military movement.

At the present time (during peace) the Austrian lines, both Government and private, are combined into more or less extensive groups, in which the distribution and control of the rolling stock is vested in special local bureaus, viz., at Vienna and at Nimburg, in Bohemia. As regards Hungary, a central

rolling stock bureau (General-Evidenz Bureau) is to be organized this autumn (1888) at Buda-Pesth, for all the Government and private railways in Hungary. The object of this office in peace-time is to be able to know every day the position of the wagons which are surplus upon one line, and so to direct them upon the lines which are short of rolling stock.

The Hungarian railway network, as it unites the eastern, southern, western, and in part the northern extremities of the empire with Buda-Pesth, is of great strategical importance. M. Baross, the Minister of Communications, not content, therefore, with the above, has offered several prizes of 500 guildens for the best essays upon the system of employing the rolling stock in local, and, especially, in through traffic, so as thoroughly to meet the demands of commercial movements. These essays will be read, as lectures, to the railway personnel at Buda-Pesth during the winter.

No doubt this serious method of dealing with the question will not only have an influence upon the success of the commercial traffic, but will be of still greater importance as regards the success of mobilization, the conduct of military operations, and the regular working of the lines of communication; because then the War Ministry, upon taking over the management of the whole system, will find itself in possession of a thoroughly trained organization, the personnel of which has acquired a thorough acquaintance with its duties by prolonged training in peace.

France.

The regulations for the transport of troops by rail, which were sanctioned on the 1st July, 1874, were altered by the decree of the 30th March, 1886. In accordance with the new regulations, the military transports are divided into two categories, viz., ordinary and strategical.

Ordinary transports are those which are carried out on the lines of the country, without interfering with the ordinary traffic. In war-time, or during mobilization, all such transports on those French lines which are under the orders of the War Ministry are carried out in accordance with the directions given by the highest military commission or its delegates.

Strategical transports are those which involve the removal of large masses of troops and their stores for a rapid concentration at one or more points. In view of the large quantity of rolling stock and extensive personnel required for movements of this character, it may be necessary to stop the ordinary traffic, or, at any rate, to curtail it. The Government, accordingly, has power to take temporary possession of private lines, at a previously specified rate of payment.

The highest military commission is the central administration, which is charged with the constant superintendence of the rolling stock, with the preparation of everything necessary for the mobilization and concentration of the troops, and with the conduct of the transport in time of war up to the base of operations. The President of the commission is Chief of the Headquarter Staff.

The commission is charged with the compilation of "*Projets de loi*," regulations, instructions, and preliminary work relative to (1), the rolling stock; (2), organization and administration of stations; (3), agreements and arrangements with railway companies; (4), formation and training of railway detachments; (5), practical matters connected with strategical railways; (6), instruction of the troops in entraining and detraining; (7), technical reconnaissance of French and foreign lines, especially in regard to their destruction and repair; (8), compilation of plans for the transport of troops.

In peace-time there are special committees under the orders of the highest military commission, upon each of the seven railways¹ (six private and one Government). The committee consists of the commissary of the line, who is an officer of the general Staff, and of the engineer commissary, who is a technical man from the railway company. The duties of the committee, according to the instructions, are to study the rayon to which it is appointed in the utmost detail, so that the personnel and matériel may be utilized to the utmost, in any strategical movement. The object of this careful study is to be able to work out exact train time-tables, and to settle all the details for the guidance of the troops during the movement. Thus, in drawing up proposals for the concentration of the Army, the committee adheres to the following programme:—(1.) Selection of the time-table which is to be employed. (2.) Number of trains proposed to be run daily. (3.) Number of wagons and locomotives required. (4.) Selection and organization of stations for supplies and halts. (5.) Selection and organization of the stations at which the troops are to arrive. (6.) Movements which are to be made along the country roads in connection with the railways.

The War Ministry communicates to the highest military commission all data relative to the movements of each corps, such as the various units composing the corps, the area of concentration, so as to enable them to draw up the plans for the movement.

The tables compiled by the commission afford materials for (1), the working of each section of the railway lines; (2), the orders to be given to the Commanders of units as to the movement, through the bureau, which deals with the movement of troops under the chief of the Headquarter Staff. In the time-tables, which are drawn up by the commission on a special form, one or two reserve trains are provided, which are only used in case of accident, but which do not form part of the general plan.

For purposes of mobilization the committees of the lines, in conjunction with the staff Officers of corps, draw up special statistical tables for each corps. The data required for this purpose are furnished by the chiefs of the recruiting offices. These statistical tables show the number of men to be called in from each district, the corps to which they belong, and the lines of railway by which they are to be forwarded.

These committees of the lines decide beforehand whether the regular ordinary trains are sufficient for the military movement, or whether it is necessary (1), to take special measures; (2), to organize special trains; (3), to carry out the despatch by échelon, and they forward their conclusions to the highest commission.

In war-time these committees become, on the French lines, as far as the frontier, regular line committees, and on foreign lines, in the occupied territory, they become military committees, their headquarters being fixed by the highest commission.

In war-time the management of all transport, beyond the base of operations, is concentrated in the hands of the Commander-in-Chief of the railways and étapes, to whom the étapes on the roads and waterways, as well as the military management of the railways for each army, acting independently, is confided. Thus the management of all the various lines of communication is

¹ The private railways are—(1) the Nord, 2,107 miles; (2) the Est, 2,462 miles; (3) the Ouest, 2,563 miles; (4) Paris-Orleans, 3,321 miles; (5) Paris-Lyons-Mediterranean, 4,772 miles; (6) Midi, 1,618 miles; (7) Government, 1,306 miles—total, 18,149 miles. In 1885 the average composition of the trains was—(1) passenger wagons, 9.74 wagons, 19.48 axles; (2) 36.13 goods wagons, 72.26 axles—total, 91.74 axles.

concentrated in his hands, and there is thus an organization ready, in case of need, to undertake the management of the communications in the various theatres of war. The Commander-in-Chief of the *étapes* and railways arranges the mode in which the trains are to be run, and distributes them as required. These measures simplify the organization of the lines of communication and of the evacuation of the sick and wounded, and also facilitate the distribution of the rolling stock in any given direction.

The question of accounting for the wagons, and of fixing their actual position at any given moment, by means of a central bureau, has not yet been decided in France, although the Director of the Railway Bureau in the Headquarter Staff thoroughly recognizes the necessity for doing so. He, however, foresees great opposition in the way of the realization of his ideas on the part of the powerful private railway companies. For regulating the distribution and for accounting for the wagons on the lines of the seven railway companies, there is a special control bureau.

M. C. Boissonet, *Sous-intendant Militaire*, in his paper entitled "*Travail de Mobilization*," which appeared in the "*Spectateur Militaire*" of 1st July, 1887, being a specialist, raises the question of the use of carrying out an experimental mobilization, with a view to testing the readiness of the rolling stock to furnish the necessary number of wagons at certain given stations, especially during the first period of the commencement of a large military movement. To this we may reply that, with the establishment in peace-time of local control bureaux and of one central office, which are accustomed every day to work the traffic and to fit in the wants of the various lines, absolute success in war may be anticipated. Nevertheless, the experiment proposed by M. Boissonet would be extremely useful, in order to see how the above offices, when handed over to the military authorities in time of war, would manage the rolling stock, and, in short, how the whole military organization would work.

Belgium.

In Belgium all the Government railway network¹ is subordinated to several wagon bureaux as regards the distribution and use of the rolling stock; and in the Ministry of Public Works at Brussels there is a central bureau which exercises a strict control over, and arranges for mutual co-operation between all the groups, so as to obtain the greatest amount of profit in the employment of the stock. On the 1st January, 1879, the above Ministry issued special instructions for the distribution and employment of the rolling stock throughout the railway system of the country, and these instructions concern not only Belgian but foreign rolling stock. In the fourteen pages of these instructions the duties of the personnel are very clearly laid down in all cases. In addition to the pamphlet of instructions, the officials, who are charged with inspection duty and with seeing that the instructions are carried out, are provided with a special blank form upon which are entered certain questions to which they have to reply. These questions refer to: (1) regularity in the mode of keeping the station registers, in which the daily requirements in wagons are entered; (2) the distribution of wagons; (3) the employment of wagons; (4) the report of all irregularity in, and fines for delay of, wagons.

Captain J. B. Eugène, in his "*Études sur les Chemins de Fer et les Télégraphes Électriques considérés au point de vue de la défense du territoire*," 1884, Antwerp, shows the necessity of the control bureaux which have been

¹ Of a total 2,700 miles in 1884, about 70 per cent. belonged to the Government.

established in Belgium in peace-time, and it may be supposed that the connection between them and the military railway organs has been thought out and placed on a thoroughly satisfactory footing.

Italy.

All the railways of Italy, with minor exceptions, belong to the Government, but are worked by private companies, who pay a rent to Government. In the Peninsula there are two such large companies. The Mediterranean Railway Company had, in 1887, 2,860 miles of railway and 14,860 goods wagons; the Adriatic Railway Company 2,917 miles and 14,600 goods wagons. In the first company the distribution and control of the employment of the wagons is in the hands of a central office at Milan, and of special local control bureaux, which in their turn communicate with the principal stations, and these again with the stations of their groups.

In the Adriatic Railway Company the distribution and control of the wagons is in the hands of a central office at Bologna, without any intermediate bureaux, but in all other respects it is the same as in the former case.

The military railway organization is, in fact, similar to that in France: it is not, however, thoroughly worked out at the present time.

The Central (mixed) Commission¹ at Rome is transferred in time of war to the seat of operations, and is placed under the orders of the Commander-in-Chief. Its president is the chief of the department which deals with the movement of troops, and superintends the transport of troops by rail on all Italian railways. The members are, the commissary of the Ministry of Public Works, the chief traffic inspectors of the Mediterranean and Adriatic railways—these latter are aided by military traffic inspectors, who are officers of the general staff, and who have passed a theoretical course in railway traffic matters of not less than two or three years, and are practically acquainted with railway work; the secretary of the commission, an Officer of the general staff, and finally some other lower members serving on behalf of the War Ministry.

The Central Commission, from the manner and spirit of its organization, has for its object the maintenance of connection between the administrative railway section in the theatre of military operations and those in rear. For this purpose the Central Commission is able, by means of its members (particularly the chief of the transport department and the chief traffic inspectors), to enter into direct communication with the management of the railways, and even directly with the subordinate functionaries on the lines, if it be necessary to save time.

As regards the movement of trains or any measures to be taken affecting the personnel outside the theatre of war, the Central Commission has recourse to the action of the line committees, chiefs of sections, and of *étapes*, who are directly under its orders.

For questions of the employment of rolling stock, *i.e.*, its collection, distribution, and the accounts, &c., the Central Commission has at its disposal a special central bureau, which is mobilized, and which follows the Central Commission to the theatre of operations; it thus forms one of the most essential organizations of the headquarters of the army in the field.

The central bureau, as regards the railways lying in rear, on which the ordinary civil traffic is still working, communicates on all questions with the central bureaux at Milan and Bologna. During war, that is from the com-

¹ Corresponding to the highest commission in France.

mencement of mobilization to the conclusion of the campaign, the intention is to adhere to a strictly centralized system, so that no commanding officer or staff has any right to give any instructions whatever to the railway stations as regards the employment of rolling stock, over the heads of the central bureaux at Milan and Bologna.

The railways are informed by the Inspector of Ministry of Public Works forty-eight hours before the commencement of mobilization. Then the wagons, which have been detailed according to previously prepared lists, are distributed to the proper stations, working on the ordinary commercial time table. On lines which are threatened by the enemy, on which the military traffic management has been established, the central bureau enters into communication with the proper authority of the military railway section, which superintends the military traffic and working, and also deals with the rolling stock allotted to it, under the superintendence and direction of the Central Commission.

In conclusion, we will briefly enumerate the chief duties of the Central Commission. It takes the initiative (1) in carrying out beforehand, on all lines, works for increasing the carrying capacity of the lines from a military point of view; (2) in supplying all sorts of material, tools, stores, &c., to the demands of the chief of the transport departments; (3) in forming and employing military railway sections; (4) in detailing the rolling stock for the independent trains of the companies of the railway troops; (5) in employing the companies of the railway battalion; (6) in detailing the special rolling stock for those lines which are threatened by the enemy on which military traffic is established; (7) in distributing and controlling the employment of the wagon park of the whole of the railways of the peninsula by means of the central bureau; (8) in taking all administrative and technical measures to secure the connection of the active army with its base; because, on the conclusion of the mobilization and concentration of the troops, the question of the regular organization of the lines of communication at once comes to the front, *i.e.*, the punctual and regular movement along the railways of all military stores and supplies.

Switzerland.

Special regulations for the working of the Swiss railways for military purposes were published in 1867.¹

In peace-time a special consulting commission is appointed, consisting of five representatives of the Swiss railways. This commission assembles at the invitation of the War Minister. The War Minister is the president of the commission, which elects the members of the committees of the lower degree for dealing with special questions. The duties of the consulting commission are in reality almost exactly the same as those of the highest commission in France. The War Department is authorized to communicate direct with the railways over the head of the consulting committee.

During war-time, a special "central direction," consisting of five members, is organized for all the railways. The Swiss Federal Council fixes the time and places of assembly of this central direction, which elects its own president and vice-president. The central direction, as soon as it is formed, immediately informs the War Department of the fact, and is then at the disposal of the supreme military authority. It also informs the railway

¹ See *Die Eisenbahnen zum Truppen-Transport und für den Krieg im Hinblick auf die Schweiz*, von Theodor Hoffmann-Merian, Chef des Verkehrs der Schweizerischen Centralbahn. Basel, 1871.

authorities that it has commenced operations, and that it has replaced the previously existing consulting commission.

The central direction receives all instructions concerning the railway service from the chief of the staff, and it reports to him upon railway matters. The direction takes special measures to ensure the fulfilment of all orders received from him. From the moment of entering upon its functions the central direction, under the supervision of the highest military authority, takes over the superintendence of the management of the whole railway service of the Swiss railways, and opens up relations for this purpose with all the separate lines. At the same time it arranges all the traffic both in regard to the transport of troops and the commercial traffic, giving all necessary instructions, &c. Except as regards the instructions given by the central direction for carrying out the work allotted by the chief of the staff, the railway managements retain their independence. The expenses of maintenance of the central direction are made good by the Federal Council. The highest military authority fixes the period at which the action of the central direction is to cease, and the central direction informs the railways of the fact.

During 1887, nine principal private railways which run through the whole of Switzerland, and which are united with one another, voluntarily altered the system of employing the rolling stock, and established a central bureau, which by means of eleven intermediate instances (the principal stations upon the small groups, corresponding to the control bureaux in other States) makes a daily distribution of all the wagons, and makes out monthly accounts between the railways. This measure has been adopted in view of the enormous economical advantage of such an organization. Even in 1877, a certain Olivier Zschokke, in a brochure, entitled "Betrieb der Schweizerischen Eisenbahnen unter Leitung des Bundes," Zürich, 1877, showed the advantages of working all the Swiss railways under the control of the Federal Government;¹ especially as regards the utilization of the rolling stock of the entire system.

Thus the central bureau which now works in peace-time in Switzerland will serve in war-time as a ready-made railway staff for the above-mentioned central direction. And all the lines will form one indivisible whole in an administrative sense, especially as regards the employment of complete military trains and separate wagons, the management and control of which will issue from one central authority through the intermediate channels. This organization will undoubtedly facilitate mobilization, and have an important bearing upon the conduct of operations.

The Principles which might be adopted as a Basis for the Introduction of a Similar Organization in Russia.

In 1869, on the initiative of the Ministry of Communications, it was deemed necessary to assemble the first congress of representatives of the railways, with a view to establishing through traffic, in the interests of trade, and at the same time to do away with the delays in the transport of stores which were of frequent occurrence upon some lines.

Direct communication was established by groups, but it was soon found that considerable difficulties occurred in practice in consequence of the existing system of utilizing the wagons,² and owing to the absence of any

¹ According to the foreign press of December, 1887, the State purchase of the railways was decided upon.

² The system of exchanging wagon for wagon.

central control of the rolling stock, under the decentralized system of accounts, which remains in force up to the present day.

In 1871, the Baltic railway, which experienced considerable inconvenience and loss owing to these causes, brought forward, in April, 1872, a project which was drawn up by its traffic manager for the establishment of a special system of accounts under the decentralized system, and for doing away with the rules for tracing the whereabouts of the wagons.

The irrational character of the system was the cause of many railways being unable to discover the whereabouts of their wagons; and this difficulty has continued to be felt throughout all the subsequent years, and even reference to the Ministry of Communications has failed to give any assistance.

The late Director of the Nicolas railway (St. Petersburg to Moscow), who enjoyed a great reputation in the railway world, insisted at the conference on the importance of devoting especial attention to the reorganization of the system of employing the wagons, and of the absolute necessity of a central administration. The representatives of the railways accordingly, in June, 1872, entrusted the author with the task of working out a project to those ends, so that it could be laid before the assembled congress. In November of the same year, the congress, being unable to discuss this project, referred the project to a committee, and in 1873 it was referred to another committee, and there the matter ended. That project showed in detail the advantages of a central bureau for the Empire in war-time, and all those objects which have been attained in Germany since 1881, and subsequently in other countries, were remarked upon.

In view of all that has been set forth above, attention must be directed to the fact that, without incurring additional expenditure, we are able to improve our existing lines, as means both of offence and defence, by perfecting our railway organization. This is necessary, too, in order that those disasters (seizure of rolling stock, non-delivery of provisions, stores, &c.), which were encountered upon other railway systems far better developed than ours, may not come upon us also.

Acting in accordance with general principles, and the example of other Western European Powers, and taking into consideration the conditions of our railway network from a strategical and commercial point of view, we would propose to divide it into seven groups, and to form common wagon parks for those groups. The centres of these groups would be as below:—

		Extent of the system.	No. of goods wagons.
1st group.	St. Petersburg	1,592 miles	20,458
2nd "	Vilna	2,944 "	21,002
3rd "	Warsaw	1,181 "	10,884
4th "	Moscow	2,913 "	17,778
5th "	Kieff	2,679 "	19,930
6th "	Moscow	2,512 "	13,638
7th "	Kharkoff.....	1,932 "	13,973
Total.....		15,753 "	117,663 ¹

¹ In the German Empire there are 250,513 goods wagons, and in Austria-Hungary 92,444; consequently the two combined have three times the number at the disposal of Russia, and they have a much closer network and a lesser area of distribution. In 1870 France kept 2,500 Belgian in the country, and Germany retained some Austrian wagons. We may consequently suppose that similar borrowings will be made in future.

Group 4 might be united to Group 6, and the former might be incorporated with the central bureau, so that we should have five separate establishments. At the present moment, the only organization which partially corresponds to this organization are the eleven Officers who are charged with the supervision of the transport of troops by railway at various points upon our system.

The management of the service of the rolling stock in the groups should be laid upon special bureaus or upon the railway administration at those centres at which the staffs of military districts and the Officers superintending the transport of troops by railway are quartered. In peace-time, these Officers and men should learn the work of accounting for, and distributing, the rolling stock; and in war-time, when these groups, or certain portions of them, become important lines of communication, these persons would be responsible for the regularity and success of the work. Then these local control bureaus would be transformed into ready-made railway staffs.

We think it extremely useful that there should be in the railway staffs and in the central administration representatives of the artillery, engineers, and intendants, so as to work out and take the necessary measures in peace-time for the supply of troops and fortresses with both provisions and warlike stores. Such a measure would surely introduce order into this important branch in war-time, and in peace it would lead to considerable economy in military expenditure. By means of these staffs, which would be in communication one with another, as well as with the central bureau at St. Petersburg, complete mutual action on the lines would be established.

The following would be the duties of military railway staffs:—

(1.) To see that all the railway officials carried out the orders of the Officers superintending the movements of troops, or those of the Officers in command of the lines of communication.

(2.) To detail the trains, both ordinary and extraordinary. To procure locomotives, wagons, and personnel for the purpose.

(3.) To control the movement of the trains, and to look after the railway signals.

(4.) To enquire into and deal with accidents: (a) to personnel; (b) to trains; (c) to the line.

(5.) To regulate the periodical despatch of transports and of troops. To account for military stores lying in the goods sheds awaiting despatch.

(6.) To look after the loading and unloading of complete trains, and to see that they are returned.

(7.) To issue all orders and instructions relating to the military movements.

(8.) To study the conditions of the working of the line in peace; and to collect all data which might aid to develop the resources of the line in war.

(9.) To train men in peace for work on the railway staff in war.

(10.) To collect and distribute various information, in accordance with the instructions of the central bureau and other higher military authorities, regarding the movements of troops and stores.

(11.) To account for and to distribute the wagons among the stations belonging to its group.

(12.) To regulate the movement, stoppage, loading, and unloading of wagons, and to see that their carrying power is completely utilized.

(13.) To keep an account of locomotives and wagons under repair.

(14.) To account for the various stores used in unloading, &c.

(15.) To account for all military appliances.

(16.) To keep a record of the exchange of wagons, and of whole military trains at the transfer stations, with the railways of the neighbouring groups which are under the orders of the Officer commanding the line of communi-

cations. To determine daily by means of these data the number of wagons and complete trains in the group.

(17.) To keep statistics of the runs of trains and of the wagons composing them.

(18.) To keep an account of payments due for rolling stock to the various lines composing the group, in accordance with any special agreements or conventions.

(19.) To take part in compiling the plans for mobilization, concentration, transport of stores, &c.

The object of the central bureau is to develop to the highest degree the co-operative action of the lines of communications or groups of railways, and to place the lines upon a proper military basis, and to assist in mobilizing the troops. The duties of this body should include the following:—

(1.) To supervise and direct the operations of the military railway staffs.

(2.) To see that all orders given by the Officers commanding the lines of communication are properly carried out.

(3.) To detail the trains, both ordinary and extraordinary. To procure for this purpose, in special circumstances, locomotives, wagons, and personnel for their service.

(4.) To control the regular running of the trains.

(5.) To enquire into and deal with accidents (*a*) to personnel; (*b*) to rolling stock; (*c*) to the permanent way.

(6.) To regulate the despatch of troops, transports, and stores, while lying in the goods sheds waiting to be sent off.

(7.) To issue special regulations and instructions relating to military movements.

(8.) To study the conditions of working of the whole of the railway system of the country, to make tours of inspection for this purpose, and to take part in the railway congresses.

(9.) To study the conditions of the commercial and military working of foreign railroads; to make tours for the purpose, and to take part in any railway conferences.

(10.) To train military men in peace-time for work in the central bureau in war-time, and so that they can be detached upon special duties relating to the rolling stock along the lines.

(11.) To account for and distribute the rolling stock among the various railway groups.

(12.) To keep an account of the exchange of wagons between the various groups, in accordance with the reports from the transfer stations, so as to know the distribution of the wagons throughout the whole system.

(13.) To keep an account of outside¹ wagons under repair.

(14.) To keep a record of the runs of outside wagons, and to be able to fix their position.

(15.) To keep accounts between the various groups of the sums due for the use of each others' rolling stock.

(16.) To take part in the work of the general staff which relates to mobilizing the rolling stock; reserve men to be called in; concentration of troops; transport of supplies, &c., for the troops and fortresses, and the lines of communication generally.

To sum up, we are of opinion that the War Ministry, when—as in time of war—it takes over, in conjunction with the Ministry of Communications, the traffic management on the whole railway system, requires special bodies which have been thoroughly organized and trained, relying upon which bodies

¹ Belonging to different groups.

it can take all necessary measures ; for, the drawing up of plans of transport is one thing, and the execution of them when they are exposed to contingencies is another.

The experience of foreign countries is that these organizations are not dear, but that they produce enormous economies,¹ consequently even in peace any expenditure connected with them is productive, while the expenditure caused by them in war is not worth mentioning.

¹ By centralizing the work which is now done by each railway individually, a considerable saving is obtained.

THE GERMAN ARMY ACT OF 1888.¹

By Lieutenant-Colonel J. S. ROTHWELL, R.A., Professor of Military Administration, Staff College.

On the 11th February, 1888, a measure became law in Germany whereby the conditions of military service in that country will in future be considerably modified. The nature of this measure will be briefly set forth here, so that the readers of the "Journal of the Royal United Service Institution" may be kept informed of the actual position of German Army organization; and, with the papers which have already appeared,² may have the means of forming a correct judgment as to the power of the German Army, whenever its elaborate mechanism is set in motion by the order to mobilize.

The changes of 1887 had to do principally with the Standing Army, which was increased by 41,135 men to correspond with the growth of population in the Empire, but the provisions of the law of 1888 relate almost exclusively to the second and third line troops, viz., the Landwehr and the Landsturm. The development of these forces was indeed a natural consequence of the previous measure. New cadres of infantry and artillery were then created (see vol. xxxi, p. 833),³ but no corresponding increase was made to the Reserve troops whose duty it is to support those in first line, and no additional provision was made for the men necessary to maintain the new cadres at their full establishment during prolonged operations.

In laying this Bill before the German Parliament, it was pointed out that the strength of an army is directly proportional to the number of years a man is held liable to serve in its ranks, and that in this respect Germany was at a decided disadvantage when compared with Russia or with France. In the former country a man, until recently, served for 15 years (6 with colours and 9 in the reserve), but this term has now been raised to 18 years (5 with the colours and 13 in the reserve), while in France the total period of service is 20 years, viz., 5 with the colours, and 4 in the reserve of the Standing Army, followed by 5 years in the Territorial Army, and 6 in its reserve.

Against these 18 contingents of Russia or 20 of France, Germany, irrespective of the Landsturm, had only 12 contingents to put forward, viz., 3 in the ranks, 4 in the reserve, and 5 in the Landwehr; so that a change in the organization of the Army, which should increase the number of classes available for active operations, was held to be imperatively necessary. The Landwehr was the force whose development could best be counted on for supplying the required increase of military strength, and accordingly the law of the 11th February, 1888, has more than doubled the period of service in this category.

The Landwehr.—Under the previous law, a German who had been three

¹ The information contained in this paper has been obtained from the "Armed Strength of the German Empire," published by the Intelligence Division, War Office, 1888; from the "Revue Militaire de l'Étranger," and from other sources.

² "The German Army in 1886," vol. xxx, page 303, and "Recent Changes in the German Army," vol. xxxi, page 827.

³ The number of these will be largely increased if (as appears probable) fourth battalions are added to the 151 regiments now with only three battalions.

years in the ranks and four in the reserve joined the Landwehr at about the age of 27, and remained in it for five years, viz., till he was about 32, when he passed into the Landsturm. Under the present law the Landwehr is composed of two Bans, service in the first of them being for five years, and corresponding exactly to the Landwehr service just mentioned, but at the termination of this service, instead of passing into the Landsturm, a man now joins the 2nd Ban of the Landwehr, and remains in it till the 31st March of the year in which he completes his 39th year. Thus the age at which the transfer to the Landsturm is carried out is postponed from about 32 to about 38, and the State becomes entitled to the military services of at least six additional contingents of Landwehr.

It is worthy of remark that in making this change the Germans are only reverting to a system which is perfectly in accordance with the history of the Landwehr. With the exception of the interval since 1867, the Landwehr has from the date of its formation consisted of two Bans, and the periods of service in each Ban are now almost identical with those which were laid down in the organization of 1814.

Under the system lately in force, no one entered the Landwehr who had not previously served in the Standing Army and the reserve, and this is still the case as regards the 1st Ban. The 2nd Ban, however, in addition to those who have belonged to the 1st Ban, receives all the men of the Ersatz Reserve who have undergone training, such men passing into it at the end of their service in the Ersatz Reserve instead of being enrolled in the Landsturm.

A change in the organization of the Ersatz Reserve has thus been brought about. This reserve, as mentioned in a former paper,¹ used to consist of two classes, of which the first was subdivided into trained men and untrained. This division into classes has now disappeared, and all men belonging to the Ersatz Reserve are liable to be called on to render personal military service, if a mobilization be ordered while they belong to this category. The length of service in the Ersatz Reserve is twelve years, and a man, on leaving it at about the age of 32, is transferred to the Landsturm if he has never been trained, but if he has undergone the partial training laid down for the Ersatz Reserve, he joins the 2nd Ban of the Landwehr, and thus takes his place besides those of his cotemporaries who have had a complete military education with the colours, and have then passed on through the reserve and the 1st Ban of the Landwehr.

The training to which the Ersatz reservist is now subjected is rather longer than it was formerly. Instead of ten weeks the first year, four the second, and a fortnight in each of the two next years, or eighteen weeks in all, he is now trained for ten weeks the first year, six the second, and four the third, or twenty in all. Training begins, as a rule, the year after a man joins the Ersatz Reserve, *i.e.*, when he is twenty to twenty-three years old, and the number of men who are annually selected to go through this training is determined by the budget, and not left to the discretion of the War Minister. The principle to be followed, however, is clearly laid down, viz., that so many men shall be annually trained that seven contingents of them will be sufficient to meet the first requirements of mobilization.² The number of men who join the Ersatz Reserve will in future be considerably below what it has been in past years, as those men of inferior physique who were formerly

¹ Vol. xxx, page 332.

² The number ordered to be trained in 1888 was 17,100, and seven contingents of this strength would furnish some 115,000 men; but as the contingents were much larger when the system was first introduced (see note, p. 333, vol. xxx), this figure does not represent the number which could be obtained from this source.

drafted into the second class of this reserve are under the present law enrolled at once in the 1st Ban of the Landsturm. The Ersatz Reserve, therefore, will be composed exclusively of young men fit for military duty who have escaped service in the ranks of the Army by having drawn high numbers, by being excused for family reasons, or for having been, when brought before the recruiting commission, either temporarily unfit, or considered unsuitable by reason of some minor bodily defect.

It has been mentioned that a man remains in the 2nd Ban of the Landwehr till the 31st March of the year in which he completes his thirty-ninth year; but this rule is modified in the case of men entering the service before their twentieth year, such men being transferred to the 2nd Ban of the Landsturm on completing six years in the 2nd Ban of the Landwehr, whatever their age may be at that time.

During the five years that a man belongs to the 1st Ban of the Landwehr he is liable to two trainings, each of fourteen days, and must present himself at an annual muster; but on passing into the 2nd Ban of the Landwehr, he has neither training nor muster to attend, and, unless war is imminent, may even emigrate without asking permission, all that is required being that he shall report his movements to the military authorities.

The law of 1888, which creates or revives the 2nd Ban of the Landwehr, is not merely to have a prospective force. Though enrolment in this category in time of peace is made to bear as lightly as possible on the German people, yet it is distinctly understood that in time of war—that is, such a war as Germany anticipates—the men belonging to the Landwehr and this its reserve will have very important duties to perform, and in view of the present state of affairs in Europe, it has not been thought judicious to allow so valuable a force to grow up simply by the transfer to it of those men who will in this and future years complete their service in the 1st Ban of the Landwehr or in the trained portion of the Ersatz Reserve. To adopt this course would have postponed the full development of the 2nd Ban of the Landwehr till the spring of 1893, and so it has been enacted by this law that all men born in 1850, or later, *i.e.*, all under the age of thirty-eight at the date of the passing of the Act, shall be at once enrolled in the 2nd Ban of the Landwehr, provided they had served with the colours or in the trained portion of the Ersatz Reserve. These men had been passed into the Landsturm on the completion of their five years in the Landwehr, but are thus brought back and made liable to Landwehr service, so that in case of sudden necessity the whole of these six contingents of trained men, whose ages range from thirty-two to thirty-eight, would become immediately available.

The Landsturm.—The law of 1888 deals with service in the Landsturm as well as with service in the Landwehr. By its provisions the Landsturm is now divided into two Bans, of which the first consists of all men fit to bear arms who do not belong to some category of the Army or Navy, and who are between the ages of seventeen and thirty-nine, and the second consists of all men between thirty-nine and forty-five. The date when a man ceases to belong to the 1st Ban of the Landsturm is the same as that on which service in the 2nd Ban of the Landwehr terminates, *viz.*, the 31st March of the year in which thirty-nine years of age are completed, and therefore no one who has been either wholly or partially trained is found in the 1st Ban of the Landsturm. The second Ban, on the other hand, includes both trained and untrained men, the former reaching it from the 2nd Ban of the Landwehr, the latter from the 1st Ban of the Landsturm, and is in fact the general levy of the able-bodied male population of the country from the age of thirty-nine till the end of the forty-fifth year.

Under the former law, liability to Landsturm service ceased at the age of forty-two; and, though no doubt such a course would have been desirable, it

was impossible to make these three extra contingents immediately available, as was done in the case of the Landwehr men who had been already transferred to the Landsturm. Men above forty-two at the date of the passing of the Act were legally exempt from all further military liability, and an extension of Landsturm service could therefore only be imposed on those whose names were then on the lists of this category: the rule being that any man born on or after the 12th February, 1846, who was in the Landsturm on the 11th February, 1888, should remain in it till his forty-fifth birthday, instead of being discharged on reaching the age of forty-two. The Landsturm will therefore not be fully developed till the year 1891.

In former times this force was only liable to be called out in case of invasion, but its trained men form a body so well suited for garrison and other duty, that it has been decided to utilize them even though the war in which Germany is engaged be offensive; and the law of 1888 provides that the Landsturm, in case of urgent necessity, may be employed for the purpose of strengthening the Army and the Navy. Under ordinary circumstances men belonging to this category would be summoned by order of the Emperor, but when there is an immediate prospect of war they can be called out by the Commanders of Army Corps, or by the Governors of fortified places, and a material gain might thus be secured at a critical moment.

The future working of the system of military service now adopted in Germany may perhaps be made clearer by the following illustration:—A, B, C, and D are four men, all born on the same day, the 1st July, 1866. In the early part of 1886 when these young men came before the Recruiting Commission, C was excused as being the only supporter of his family, D was found to be considerably below the regulation height, while A and B were in every respect fit for service in the ranks of the Army. A and B were accordingly admitted to the lot drawing, D was put back to come up again next year, and C was noted for enrolment in the Ersatz Reserve. In the lot drawing, B drew a high number and A a low one, and thus A had to serve in the ranks, while B passed into the Ersatz Reserve. B was among the men of this Reserve who were afterwards selected for training. D, after having been again put back in the spring of 1887, was finally disposed of in 1888, when, as no improvement had taken place in his physique, he was enrolled in the 1st Ban of the Landsturm. The service of each of these men in the different categories of the Army will be seen by the following table:—

	Commencement of liability to Landsturm service.	Commencement of service with colours, or enrolment in Ersatz Reserve.	Commencement of service in the Reserve.	Landwehr service.		Landsturm service.		Date of termination of military liability.
				Commencement of service in 1st Ban.	Commencement of service in 2nd Ban.	Date of enrolment in 1st Ban.	Date of enrolment in 2nd Ban.	
A (serves with colours	1.7.83	1.10.86	29.9.89	31.3.94	31.3.99	—	31.3.1905	1.7.1911
B (in Ersatz, trained)	1.7.83	1.10.86	—	—	31.3.99	—	31.3.1905	1.7.1911
C (in Ersatz, untrained)	1.7.83	1.10.86	—	—	—	31.3.99	31.3.1905	1.7.1911
D (in Landsturm)	1.7.88	—	—	—	—	1.5.88	31.3.1905	1.7.1911

It will be noticed in the case of A that his transfer from the Reserve to the Landwehr is not made till the spring following the date on which his four years' Reserve service actually terminates, and thus during the winter

months there are five contingents of Reserve men at the disposal of the German Government, instead of the four classes which are generally considered to compose this category.

Before concluding this short account of the German Army Act of 1888, it may be as well to mention the probable cost of the changes involved. In time of peace no great expense is incurred by keeping the men's names on the rolls, as the machinery for this already exists in the Landwehr organization; but to make these men efficient on the outbreak of war, arms, clothing, and equipment have to be provided, and kept in readiness. The present estimate is for about 700,000 combatants, who are set down at only 240 marks (12*l.*) per man, or some 8½ millions sterling; but as the total cost of the changes is to amount to 278,335,562 marks or nearly 14 millions sterling, it may be inferred that at all events a part of the sum remaining will be devoted to the equipment of the Landsturm.

The great gain secured to Germany as a military Power by the passing of the law of 1888 is that six additional contingents of trained and partially trained men become immediately available on the outbreak of war for active operations, while the number of untrained men who can be drawn upon for military service is increased in a still higher ratio.

The numbers which may fairly be counted on when the present law is in full operation may be seen approximately from the table given below, which is based on the assumptions that the average number of young men fit for service, reaching the military age annually, amounts to about 310,000; that the contingent taken for the Army, exclusive of one-year volunteers, is 152,000, and that 18,000 of the Ersatz Reserve are called up annually for training in their first year's service:—

Age.	Category.	Fully trained.	Partially trained.	Untrained.
17—20 (3 contingents).	Landsturm, 1st Ban.....	—	—	900,000
21—23 (3 contingents).	Active Army.....	467,000	—	—
	Trained Ersatz Reserve ..	—	52,000	—
	Untrained Ersatz and Landsturm, 1st Ban	—	—	378,000
24—27 (4 contingents).	Reserve	560,000	—	—
	Trained Ersatz Reserve ..	—	63,000	—
	Untrained Ersatz and Landsturm, 1st Ban	—	—	454,000
28—32 (5 contingents).	Landwehr, 1st Ban	611,000	—	—
	Trained Ersatz Reserve ..	—	69,000	—
	Untrained Ersatz and Landsturm, 1st Ban	—	—	495,000
33—38 (6 contingents).	Landwehr, 2nd Ban.....	618,000	69,000	—
	Landsturm, 1st Ban.....	—	—	500,000
Total, exclusive of Landsturm, 2nd Ban....		2,256,000	253,000	2,727,000
39—45 (7 contingents).	Landsturm, 2nd Ban	612,000	62,000	495,000
Total, including Landsturm, 2nd Ban.....		2,868,000	315,000	3,222,000

Total number of men available, 6,405,000.

From these figures it will be seen that Prince Bismarck, when speaking in support of the measure, a few days before it became law, was justified in asserting that it would enable Germany, if attacked simultaneously on two sides, to send a million of men towards each frontier, and still to have a third million in reserve ready to be sent to that theatre of war in which its presence might be most required.

NOTICES OF BOOKS.

Letters on Artillery. By PRINCE KRAFT OF HOHENLOHE-INGELFINGEN. Translated by Major N. L. WALFORD, R.A. London: Stanford, 1888. Pp. 420. Size $7\frac{1}{2}'' \times 5\frac{1}{4}'' \times 1\frac{1}{4}''$. Weight under 1 lb. 6 ozs. Price 7s. 6d.

Thank goodness, at last one of the very ablest military works published in Germany since the war of 1870 is at length available for those who read English only; and we at once join with Major Walford in expressing, as he has done in his preface, his thanks to the Committee of the Royal Artillery Institution, in whose Proceedings the translation originally appeared, for allowing him and the enterprising publishers to reproduce it for the benefit of the Service generally. For although, as an artillery Officer said of this book in our hearing, "I did not understand artillery until I had read it," yet the work is just as valuable and useful to soldiers of all arms as it is to gunners. One class of men will suffer from its publication, the lecturers on military subjects; for henceforth the bits of their lectures which they considered the choicest morsels, and which certainly the audiences appreciated most, were extracts or quotations from Prince Kraft's letters. And now the monopoly they possessed of the knowledge of this work, so long as it was untranslated, ceases. This, the work under notice, is the very book which all lecturers and teachers have been quoting from, and recommending all soldiers, cavalry, infantry, as well as artillery, to study, and this advice we heartily indorse.—L. A. H.

German Field Exercise, 1888. Part II. *The Fight.* Translated by Captain W. H. SAWYER, Brigade-Major, First Brigade, Aldershot. London: Stanford, 1888. Pp. 80. Size $6'' \times 4''$. Weight under 4 ozs. Price 1s.

The New German Field Exercise. Part I. *The Portion on Drill in Extended Order.* Part II. *Attack and Defence Complete.* Translated by G. J. R. GLÜNICKE, M.A., Assistant Master, Bedford Grammar School, and Captain in the Volunteers. Bedford: F. Hockliffe. London: Simpkin, Marshall, 1888. Pamph. Pp. 71. Size $6'' \times 4\frac{1}{2}''$. Weight under 4 ozs. Price 1s. 6d.

Both translators have, in their desire to put at once before English readers the most valuable part of the Exerzir-Reglement which soldiers of all countries are now carefully studying, omitted much of the original publication, and have confined themselves to what is of practical use to English soldiers. We hope that ere long the whole of the Reglement will be translated. Captain Glünicke has included some interesting details of Zug Drill in Extended Order which we hope Captain Sawyer will bring into his second edition. As regards the respective value of the translators, that by Captain Sawyer is far more accurate and closer to the original than is the other. The nomenclature of the former is also preferable; "fighting-line" in the one, the obsolete "skirmishers" in the other; we prefer also "close formation" to "column." At paragraph 25 of Captain Glünicke's work is a serious mistake: where 40 yards is given as the front of a company of 100 men, instead of the length given in the Reglement, 100 metres. In Captain Glünicke's book more than one mistranslation are to be found.—L. A. H.

The Military Map of Aldershot and Surrounding Country. Scale 3" to 1 mile. Price 2s. Gale and Polden, Chatham.

The boundaries run north by the Staff College, east by Pirbright, south by Crooksbury Hill, and west by Fleet Pond.

Questions and Answers on Cavalry Outposts. By Captain R. H. MORRISON, Commandant School of Instruction for Auxiliary Cavalry. Gale and Polden, Chatham. Pp. 32. Price 6d., or 5s. per dozen.

Catch Questions on Infantry Drill. By Lieutenant-Colonel D'ARCY-EVANS, 1st Batt. R. I. Rifles. Gale and Polden, Chatham. Pp. 32. Price 6d. or 5s. per dozen.

Field Works: their Technical Construction and Tactical Application. By Colonel C. B. BRACKENBURY, R.A., with Appendices and Nineteen Plates, being the 7th Volume of Military Handbooks for Officers and N.C.O. Edited by Colonel C. B. BRACKENBURY. London: Kegan Paul, 1888. Pp. 359. Size $6\frac{3}{4}'' \times 4\frac{1}{4}'' \times 1''$. Weight under 1 lb. 6 ozs. Price 12s.

In paragraph 52, Part II, "German Field Exercises," 1888, we read: "The increased importance of artificial cover is due to the fire-action of the modern rifle. Prepared at the right time and place, the service it renders the troops and their leaders is important, and at times indispensable. It should, however, be subservient to the leader's plans, and in no way govern them . . . Tactical training is required on the part of Commanders in order to know *when* and *where*, as well how to entrench."

It is this "when" and "where," rather than the "how," that Colonel Brackenbury explains to his readers in his always clear and incisive language. Colonel Brackenbury's wide personal experience of modern war, and the great range of his reading, give to this book a weight and authority of a commanding character. It is a work of the greatest value in enabling soldiers of all kinds—regular, militia, or volunteers, to become more efficient for home defence; and, on the other hand, the lessons taught in it are applicable to Continental warfare. It is a book not for Engineers only, it is for the Service generally. As the author at page 211 says: "In the case here given, one of the decisive battles of the world turned on the question of proper village preparation in defence. It is a great lesson, and should surely teach us that every Officer, before pretending to lead men in war, should at least be an adept at this branch of his profession. There is far too common a tendency to treat such simple work as a study only for Engineers. Is, then, every Officer who finds himself with a company in a farmhouse under critical circumstances to need the dry nursing of an Engineer?" Most assuredly not; therefore it cannot be too strongly impressed on the readers of Colonel Brackenbury's work, that if they wish to profit by his valuable teaching on the Tactical Application of Field Works—if they wish his teaching to be of practical use to them on service, they must, after studying this book, take up in earnest the branch of the subject (technical construction) which is only lightly touched on in this volume, and master the dull dry details of field engineering; and if anything will help to induce them to do this, it is the influence which a knowledge of field engineering may have on a battle when properly applied, and so ably shown by Colonel Brackenbury. —L. A. H.

Life and Opinions of Major-General Sir Charles Macgregor, K.C.B., C.S.I., C.I.E., Quartermaster-General in India. Edited by Lady MACGREGOR. Edinburgh and London: Blackwood, 1888. Two vols. Pp. 773. Size $9'' \times 6'' \times 3\frac{1}{4}''$. Weight under 4 lbs. 10 ozs. Price 35s.

That "the child is father of the man" is, if trite, tolerably true; and when at page 33 of the first volume of the work we read the opinions held, with regard to soldiering, by a boy not 18 years of age who has been only that number of months in the Service, and as he writes is engaged as an Ensign in military operations, we can pretty safely prophesy for him a career of disappointment—disappointment great in proportion to his own capacity as a soldier. A young fellow who, when everything before him should appear *couleur de rose*, could say of the Service into which he had entered that from the moment a man joins it he is a slave—"a slave at the beck and call of your seniors, who might abuse you, bully you, and use you unjustly, without your even being able to hope for redress," and who therefore

expresses a wish to leave the Service and sit on a stool in a bank, cannot, however able, have a happy future before him. A real soldier he was at heart; at 20 years of age his ambition was to "write P.S.C." (Passed Staff College) "as well as V.C. after my name, foremost with my book as with my sword." This hankering after the Victoria Cross seems to have clung to him through life, and one of his earliest disappointments was not obtaining it for his gallant conduct at Daryabad. That a brevet, to which he fully considered himself entitled, is not given to subaltern Officers, was another sore point with him. But his ability was already recognized by the authorities; for when only 22 he is asked by Sir Hugh Rose to put down in writing his opinions on irregular cavalry. We have dwelt on these characteristics of Sir Charles Macgregor in his youth because they seem to us to have clung to him through life. Sir Charles Macgregor stood, as we all know, in the front rank of Indian soldiers, and the light thrown on his career, and on the events in which he took part, by Lady Macgregor in her work, is a valuable aid in the study of contemporary Indian history.—L. A. H.

The Career of Major George Broadfoot, C.B. (Governor-General's Agent, N.W. Frontier, 1844-45), in Afghanistan and the Punjab. Compiled from his papers and those of Lords Ellenborough and Hardinge, by Major W. BROADFOOT, R.E. London: John Murray, 1888. Pp. 427. Size 9" x 6" x 1½". Weight under 2 lbs. 6 ozs. Price 15s.

India is assuredly the hotbed of great reputations, and the crop increases year by year so largely, that owing to the number which crowd on us, there is danger of some of those which came into existence in former years being overlooked or forgotten. We are glad, therefore, that simultaneously with the publication of the *Life and Opinions* of the late Major-General Sir Charles Macgregor, appears the book which is the subject of this notice. The foremost men of to-day are engaged in strengthening the edifice which has been reared on a foundation laid by men of the age in which George Broadfoot lived and worked. The problems which for solution fell to the lot of Broadfoot and his cotemporaries, were the first Afghan War, 1838-42, the administration of the Tenasserim Provinces, 1843-44, and the conduct of the policy with the Punjab, 1844-45, when the Sikhs invaded British India and war was declared. The first thirteen years of Major Broadfoot's life in India were uneventful. But into the last six out of the twenty which he spent in that country were crowded incidents and events which gave him opportunity to show the man he really was. That brief time is commenced by the defence of Jellalabad, it closed with his untimely death at Ferozeshah. This book is full of the hitherto secret unwritten history of that period.—L. A. H.

Life Aboard a British Privateer in the time of Queen Anne: being the Journal of Captain Woodes Rogers, Master Mariner, with notes and illustrations. By R. C. LESLIE. London: Chapman and Hall, 1889. Pp. 143. Size 8" x 6" x 1¼". Weight under 1½ lbs. Price 9s.

Captain Rogers in 1708 left England and sailed round the world, accomplishing his voyage in two years and three months. During it he discovered the original Robinson Crusoe. A record of British pluck in the past, like this, is well worth reading.

Notes of Conversations with the Duke of Wellington, 1831-51, by Philip Henry, 5th Earl STANHOPE. London: John Murray, 1888. Pp. 332. Size 7½" x 5¼ x 1½". Weight under 1 lb. 6 ozs. Price 7s. 6d.

Wellington: or the Public and Private Life of Arthur, First Duke of Wellington, as told by Himself, his Comrades and his Intimate Friends. By G. LATHOM BROWNE. London: Allen. Pp. 374. Size 7½" x 5" x 1¾". Weight under 1 lb. 14 ozs. Price 6s.

The first of these books is a record of notes of conversations between the late Lord Stanhope and the Duke of Wellington, and after having been privately printed and

read, are, on account of the interest excited by them, given to the public by the present Earl. The names alone are sufficient guarantee for the value of the book. The second is of course rather of the form of a compilation from documents, and in it is put together material which would not have been accessible to ordinary readers. It is full of interest.

Thirty Thousand Years of the Earth's Past History, read by aid of the Discovery of the Second Rotation of the Earth. By Major-General A. W. DRAYSON, F.R.A.S. London: Chapman and Hall, 1888. Pp. 146. Size $7\frac{3}{4}'' \times 5\frac{1}{4}'' \times \frac{3}{4}''$. Weight under 14 ozs. Price 5s.

This is an exposition of an astronomical problem of a high order; and Colonel Drayson has set himself to work to endeavour to prove, contrary to general belief, that the second rotation is a fact. General belief, even among experts, is not conclusive, and therefore Colonel Drayson's theory may, for all we know to the contrary, be correct.

The Young Officer's "Don't." Hints to Youngsters on Joining. London: Chapman and Hall, 1888. Pp. 31. Price 1s.

Marine Engines and Boilers. By G. C. V. HOLMES, Secretary of the Institute of Naval Architects, Whitworth Scholar. London: Chapman and Hall, 1889. Pp. 129. Size $7\frac{3}{4}'' \times 5\frac{1}{2}'' \times \frac{1}{2}''$. Weight under 10 ozs. Price 3s.

This book is one of the South Kensington Museum Science Hand Books. The object of the author is to supply, as far as possible, in conjunction with the collection of models relating to marine engineering at South Kensington Museum, a continuous account of the progress and development of the marine engine and boiler from the date of its first practical introduction, just a century ago, down to the present time.

Le Général Jomini, sa Vie et ses Écrits. Par FERDINAND LECOMTE, Troisième Édition, revue et augmentée, avec une Atlas. Lausanne: Benda, 1888. Pp. 457. Size $8\frac{3}{4}'' \times 6\frac{1}{4}'' \times 1\frac{1}{4}''$. Weight under 2 lbs. Price 12s.

In the former editions of this work, the second of which was published in 1869, Colonel Lecomte divided the subject into two parts, one of which dealt with the biography, and the other with the writings of Jomini. In this edition the two are combined and additions made.

Modern Shot Guns. By W. W. GREENER. London: Cassell. Pp. 192. Size $8'' \times 6 \times \frac{3}{4}''$. Weight under 1 lb. Price 5s.

In this book Mr. Greener endeavours to give the intending purchaser of a modern shot gun such directions as will enable him to obtain the article best suited for the purpose, to load it to best advantage, and to keep it in good condition ready for immediate use; and in addition, he enters most fully into the "whys" and the "wherefores" of the different details connected with the subject.

The Records of the Woolwich District. By W. T. VINCENT. London: Virtue. Part I. Pp. 44. Weight under 6 ozs. Pamph. Price 1s.

The commencement of a record, the result of a compilation extending over the leisure of twelve years, and evidently executed *con amore*.

A Pocket Treatise of Ammunition. By CHAS. C. DU PRÉ, late Captain 3rd Middlesex Artillery. London: Clowes, 1888. Pp. 141. Pamph. Price 1s.

A handy compilation.

Orient and Occident. By Major-General BEVERLEY METFORD. London: Allen, 1888. Pp. 359. Size $7\frac{1}{4}'' \times 5\frac{1}{2}'' \times 2''$. Weight under 2 lbs. 2 ozs. Price 8s. 6d.

A record of a pleasure trip from India, *via* China, Japan, California, and across America, home.

Modern Tactics. By Captain H. R. GALL, late 5th Fusiliers. London: Allen, 1889. One vol. Text, pp. 268; one vol. Plates. Size 10" x 6½" x 1½". Weight under 2 lbs. 12 ozs. Price 10s. 6d.

This book is intended for military students, to help them in their examinations.

On Tactics and Organization, or English Military Institutions and the Continental Systems. By Captain F. N. MAUDE, R.E. London: Thacker, 1888. Pp. 587. Size 7¼" x 5½" x 2". Weight 1 lb. 14 ozs. Price 6s.

A series of contributions to periodical literature, on many of the pressing military questions of the day. Somewhat sketchy, but pleasant reading.

An Indian Olio. By Lieutenant-General E. F. BURTON, of the Madras Staff Corps. London: Blackett. Pp. 388. Size 7½" x 5¼" x 1½". Weight under 1½ lbs. Price 7s. 6d.

This is a second and interesting record of views and experience gained during a lifetime spent in India.

Life of Oliver Cromwell. By F. GUIZOT. London: Bentley and Son, 1887. Ninth Edition. Pp. 452. Size 7½" x 5" x 1½". Weight under 1½ lbs. Price 6s.

A new edition of a work which may be regarded as classical.

The Royal Naval Engineer's Note-Book, arranged for the Steam Branch Afloat. By JOHN N. HARVEY, Fleet Engineer, R.N. Gale and Polden, Chatham. Pp. 196. Size 9¼" x 7½" x 1". Weight under 1 lb. 12 ozs. Price 4s.

This is an arranged note-book, in which is laid down in a systematic manner the various manipulations necessary to become master of the engine-room. The book is published with the hope that it may be a stepping-stone to a perfect system throughout the steam branch afloat.

'83 to '87 in the Soudan, with an account of Sir William Hewett's Mission to King John of Abyssinia. By A. B. WYLDE. Two vols. London: Remington, 1888. Pp. 652. Weight under 3 lbs. 12 ozs. Size 8½" x 6" x 3". Price 30s.

This is a very valuable book, giving the results of close observation and study on the spot. Words of warning there are towards the end: "Italy can do through Massowah (which she will never give up, in spite of fifty Berlin Treaties) what England refuses to do at Suakim, and if required she will obtain the aid of every English commercial house that has ever had any dealings with the Soudan, and she will receive the moral support of every well-wisher that would like to see her African policy a success, and what Egypt or Turkey can never perform, viz., the civilization and advancement of the Eastern African tribes."

Historical Records of the 6th Dragoon Guards, or the Carabiniers. By Captain H. SPROT. Chatham: Gale and Polden. Pp. 76. Size 7¼" x 5" x ¼". Weight under ½ lb. Price 4s.

A continuation of the history of the Regiment from 1839 to 1888, with a short abstract of the services of the Carabiniers previous to 1839.

The First Class Army School Certificate made Easy. By an ARMY SCHOOLMASTER. Chatham: Gale and Polden. Pp. 329. Size 7" x 5½" x 1". Weight under 14 ozs. Price 3s. 6d., post free.

A useful book.

EXTRACT FROM THE BY-LAWS.

Section II.—Composition.

1. Princes of the Blood Royal; Lords Lieutenant of Counties; Governors of Colonies and Dependencies; Officers of the Army, Navy, Marines, Her Majesty's East Indian Military and Naval Forces, Militia, Yeomanry, Royal Naval Reserve, and Volunteer Corps shall be entitled to become Members, *without ballot*, on payment of the Entrance Fee and Annual Subscription.

N.B. Any Officer coming within the above definition, who may wish to become a Member of the Institution, can do so by copying one of the subjoined Forms, and inclosing it to the Secretary:—

FORM FOR BECOMING AN ANNUAL SUBSCRIBER.

15

It is my desire to become a Member of the Royal United Service Institution; and I hereby request and authorise my Agents [or Bankers], Messrs. _____, to pay my Entrance Fee (£1) and Annual Subscription (£1) now, and as it becomes due on the 1st of January in each year, to the Secretary of the Institution.

Signature.

Qualification
for Membership.

FORM FOR BECOMING A LIFE SUBSCRIBER.

It is my desire to become a Life Member of the Royal United Service Institution; and I hereby authorise my Agents [or Bankers], Messrs. _____, to pay my Entrance Fee (£1) and Life Subscription (£9) to the Secretary of the Institution.

Signature.

Qualification
for Membership.

2. Ex-Governors of Colonies and Dependencies, Retired Officers, Deputy Lieutenants of Counties, Civil Functionaries who are or have been attached to the Naval and Military Departments, the Master, Deputy Master, and Elder Brethren of the Trinity House, and Army and Navy Agents, shall be *eligible* to become Members by *Ballot*.

3. Gentlemen above the age of *fifteen*, whose names are on the list of the Commander-in-Chief for Commissions in the Army, or who are probationary for offices connected with the Naval and Military Professions, shall be *admissible*, by *Ballot*, to become *PROVISIONAL MEMBERS* from year to year, on payment of the Annual Subscription; and after they obtain their appointments, they may become ordinary Members on payment of the Entrance Fee.

N.B. Members admissible by *Ballot* must be proposed and seconded by two Members of the Institution, and their names will be submitted to the Council for election. *Ballot* papers may be obtained at the Institution.

Form of Request.

I give and bequeath unto THE ROYAL UNITED SERVICE INSTITUTION, situated in Whitehall Yard, London, the sum of

_____ to be applied in and towards carrying on the designs of the said Institution, such Legacy to be paid out of such part of any personal Estate not specifically bequeathed as the law permits to be appropriated by Will to Charitable Purposes.

No. 146 CONTAINS:—

	PAGE
The Propelling Machinery of Modern War Vessels. By H. J. ORAM, Esq., R.N., Controller of the Navy's Department, Instructor in Marine Engineering, Royal Naval College, Greenwich.	865
The Military Defences of Victoria. By Major T. R. DISNEY, R.A., late Commandant, Victorian Military Forces.	887
Modern Military Rifles and Fire Tactics. By Colonel C. G. SLADE, h.p., late Rifle Brigade.	890
Names of Members who Joined the Institution between 1st July and 31st December, 1888.	910

OCCASIONAL PAPERS.

Coast Defence Systems, from Foreign Sources.	921
Russian Infantry Tactics. By Captain C. A. COURT, Rifle Brigade.	957
The Organization of a Staff for Military Railway Work and of a Central Management for the Control of Rolling Stock in War Time. By Colonel A. VON FENDRIKH. Translated from the Russian Military Magazine by Captain J. WORM MURRAY, R.A., D.A.A.G.	1003
The German Army Act of 1888. By Lieut.-Colonel J. S. ROTHWELL, R.A., Professor of Military Administration, Staff College.	1033
Notices of Books.	1089

THE COUNCIL of the ROYAL UNITED SERVICE INSTITUTION are desirous of obtaining the assistance of OFFICERS of the NAVAL and MILITARY SERVICES in carrying out the Courses of Lectures at the Institution.

Officers who will favour the Institution with a Lecture, or a Course of Lectures, are requested to communicate with the Secretary.

The Lectures, and the Discussions which follow them (or an Abstract of them), and Descriptions of Inventions, are published in the Journal of the Institution, subject to the discretion of the Council, and illustrated, when necessary, by Diagrams.

By order of the Council,

B. BURGESS, Captain,
Secretary.

